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Motorship

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Why steam-driven tugs are becoming obsolete

400 B-hp. McIntosh & Seymour Diesel Engine for tugboats.

Note the clean-cut lines, compactness and low height.

A McIntosh & Seymour Diesel-Electric Tug of certain power costs $140,000; an equally powerful steam tug $118,000. ¶ The annual fuel cost for the steam tug will be $27,570. ¶ Comparison of total annual operating costs including interest and depreciation, shows a $21,000 saving for the Diesel tug. ¶ In other words, repayment of added cost, $22,000, for Diesel-electric power is almost complete in one year and the annual saving should pay for the Diesel tug in less than seven years. ¶ The figures are based on proven performance. *They can be realized in your service.* ¶ When you seek the utmost Diesel economy, think of McIntosh & Seymour.

McIntosh & Seymour Corporation, Auburn, N. Y.

McIntosh & Seymour Motor Ships

NOV., 1927 PRICE 35c.

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Motorship

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Volume XII November, 1927 *Number 11*

Australia is Using Diesel Engines for Her Coastwise Coal Trade

Australian Coastwise Problems Are Similar to Those of the U. S. Progressive Shipowners Now Use Well Equipped Motorships for Coal Transportation. This Represents a Triumph for Motorship Economy

CONTRACT will shortly be placed for colliers to be engaged in coastwise transporation of coal from Hampton Roads. This in itself is nothing of a novelty but is rather in the nature of good news which American shipbuilders can, from time to time, expect.

We wonder, however, if the owners of these proposed vessels, and indeed the owners of similar vessels engaged in similar trade have ever stopped to consider what they can learn from a study of conditions on the Australian coast.

The Australian eastern seaboard, as we have pointed out on several occasions previously, has many points of similarity to the American eastern seaboard. The length, for example, between Cape York and the southern end approximates somewhat to the length of coast between the St. Lawrence estuary and Key West. The greatest point of similarity lies in the fact that near to each coast lies large coal deposits and that each coastline has a tapping port from which large quantities of coal are exported. Newcastle in the case of the Australian coast, and the Hampton Road ports in the case of the United States coast lines are the ports in question.

The Adelaide Steamship Company, which controls a great deal of the coal export from Newcastle, New South Wales, in addition to being shipowners, is also one of the largest proprietors of collieries in the world, and it may come as a surprise to American colliery owners to learn that the Adelaide Steamship Company now finds it more economical to use Diesel propelled ships as colliers than it does to employ steamers. So much so is the case that our latest information is that they have practically decided to cease building any new steamers for their coastwise coal trade and to employ nothing but Diesel engined ships. This is a remarkable state of affairs and may even cause gratifying surprise to those of us who are accustomed to think in terms of motorship economies; but it is very gratifying to find that after strenuously and continuously preaching the doctrine of economy of the motorship for coastwise runs, we find our preachings so definitely endorsed by the Adelaide Steamship Company. There is no need to preach any more that the motorship is superior to the steamer on long ocean hauls. Everybody knows that now, and on long hauls the motorship has a strangle hold on the steamer which it will be difficult for the latter to shake off. With coastwise trade it is different. Here the motorship still has to prove itself, but as far as America is concerned, it is largely owing to the lethargy of owners and disinterestedness of their advisers that further progress has not been made. Thus it has fallen to the lot of Australia definitely to show the lead in this direction at this time.

The Motor Collier Mulcra is operated by Adelaide Ss. Co. more cheaply than a steamer

Australian coastwise problems are similar to those of America. Navigation laws are closely comparable. These two countries, while not the only countries with long coast lines, are the two most similar countries and any development which takes place in Australia has a very definite application also in America. In Brazil problems are somewhat different, although even here a fleet of powerful passenger motor vessels is being completed for service. The Adelaide Steamship Company today is in proportion to its size, a large operator of Diesel-engined ships. All its new construction for the last two or three years has been motorships and it is practically certain that further motorship contracts will be placed in the immediate future. The vessels we have particularly in mind and which are employed running alongside steamers in the coastwise coal trade from Newcastle, N.S.W., are three in number and have deadweight tonnages of 5,100 for two ships, and about 1,450 for one ship respectively. They carry coal anywhere around the Australian coast and their terminal port is generally arranged to be within 30 to 60 miles of a coal shipping

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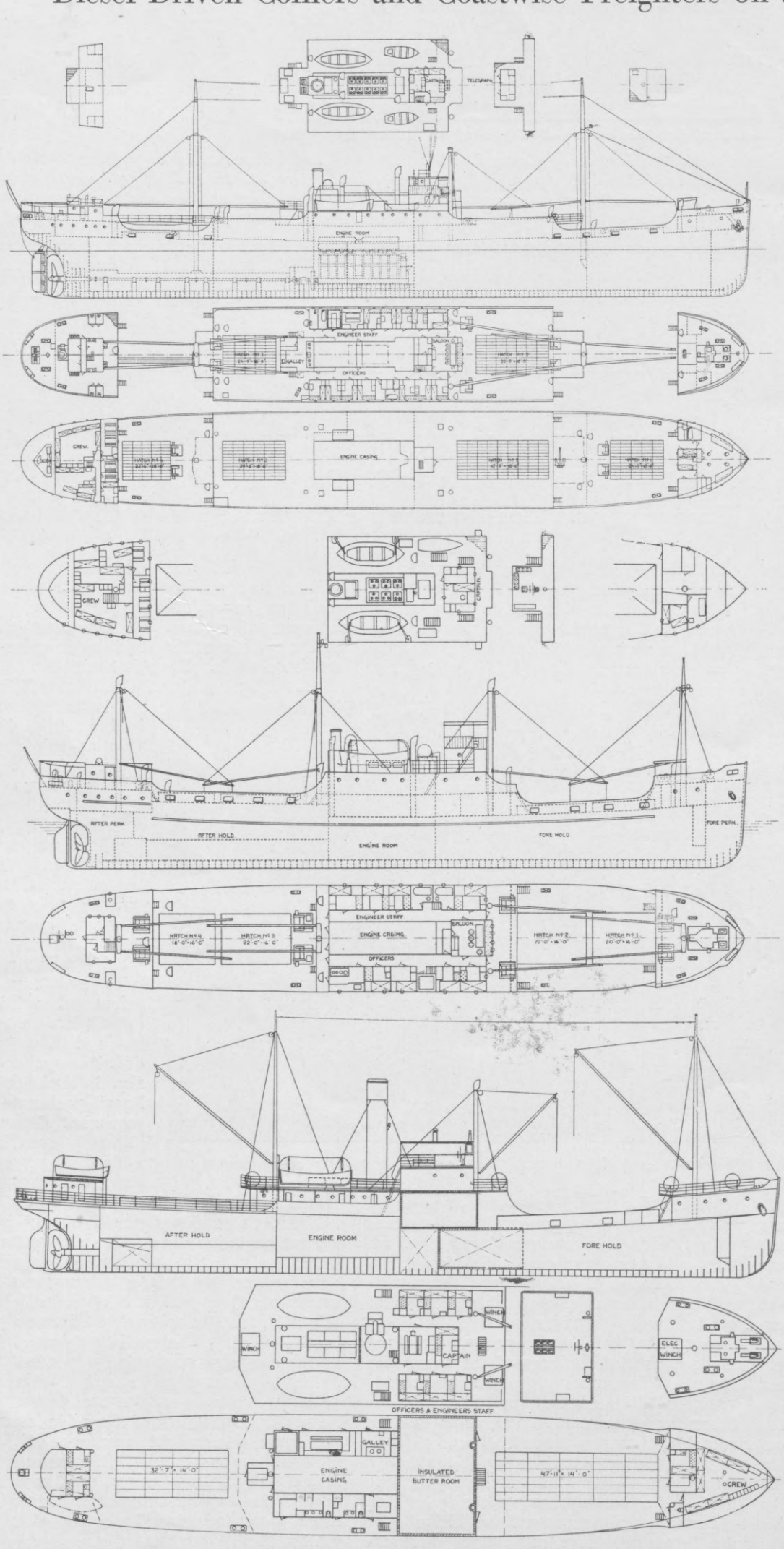
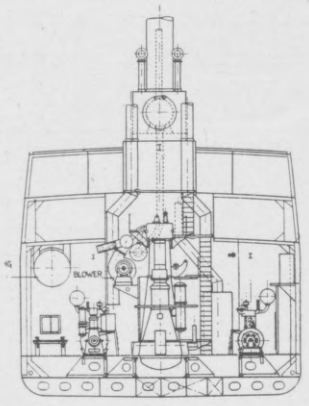
Diesel Driven Colliers and Coastwise Freighters on the Australian Coast



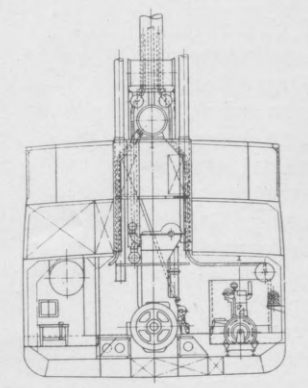
Ms. Momba (Collier)

Length b.p. ..... 331.8 ft.
Beam mld. ..... 46.5 ft.
Depth mld. ..... 23.1 ft.
Deadweight ..... 5100 tons
Power ..... 2500 i.hp.



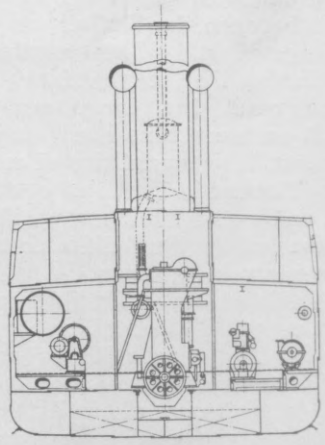
Ms. Mulcra (Collier)

Length b.p. ..... 215.0 ft.
Beam mld ..... 34.0 ft.
Depth mld. ..... 15.5 ft.
Deadweight ..... 1500 tons
Power ..... 770 i.hp.



Ms. Nimbin (Coaster)

Length b.p. ..... 215.0 ft.
Beam mld. ..... 35.0 ft.
Depth mld. ..... 13.0 ft.
Deadweight ..... 960 tons
Power ..... 1350 i.hp.



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port so that they can, if coal export is slack, carry general cargoes, but when the coal business is brisk they can always be on hand for coal cargoes.

The two largest ships, the MOMBA and MUNDALLA are fine vessels of three-island type with poop, long bridge deck, and forecastle. In a compact machinery space there is an 8-cylinder long-stroke B. & W. Diesel engine developing about 2,500 i.hp. at 95 r.p.m. and giving the ship a service speed of about 11½ knots. This engine, from the general arrangement plan of the ship may seem at first sight rather large for the size of the ship, as indeed was on first examination the single-screw long-stroke engine of the fast passenger vessel MINNIPA, completed recently for the Company's service between Port Adelaide and Port Lincoln and referred to at some length in MOTORSHIP. In fact, the engine of the MOMBA and her sister ship MUNDALLA actually pierce the upper or strength deck. It is understood, however, that Australia's coastwise navigation conditions render it necessary for a complete double engine-room crew to be maintained in a twin screw ship and that, therefore, wherever possible Australia's motorship owners endeavor to fit a single engine.

Progressive design is shown in the arrangement of accommodation which is completely in a house amidships on a bridge deck, navigating officers being on the starboard side and the engineers on the port side, with the galley at the aft end of the structure and a saloon at the forward end. The crew is carried in the poop.

The vessels have a length b.p. of 331 ft., a beam molded of 46.5 ft. and a depth molded to the upper deck of 25.5 ft. The gross tonnage is 3,021 tons. There are six water tight bulkheads, four hatchways and four holds, two forward and two abaft the machinery space.

The third vessel we have in mind is the motor collier MULCRA which is in all respects smaller and is interesting as being one of the few motorships of raised quarter deck type afloat. She has, as the general arrangement drawing shows, two holds one forward and one abaft the engine room. As in the case of the larger vessels the whole of the engineer and deck officers are arranged in a single house amidships, thus making a very compact layout. The ship has a length b.p. of 215 ft., beam molded of 34 ft. and a depth molded of 15.5 ft. The gross tonnage is 1,168. In each case great attention has been given to cargo handling facilities, and winches and booms, as will be seen, are arranged in the most advantageous positions. This ship being smaller, has a 6-cylinder, Burmeister & Wain Diesel engine developing 1,000 i.hp. at 125 revolutions per minute. The guaranteed daily fuel consumption is about three tons. During the trials this vessel made a mean speed of 11½ knots with a fuel consumption of 0.31 lb. of fuel per i.hp. per hr., including consumption of the auxiliary engines.

A somewhat similar ship to the MULCRA is the NIMBIN, completed recently for Australia's coastwise service for the North Coast Steam Navigation Co., Ltd., Sydney, N.S.W. This vessel is also of raised quarter deck type and is intended for general coastwise work and has a specially shallow draft in order to enable her to navigate rivers. The after end of the forward hold of this ship is insulated and a portable wood bulkhead is fitted at the forward end of the space thus dividing the large hatch to the main hold and the refrigerated hold when the latter is in use. There is also a refrigerated hold fitted in the 'tween decks and the two holds are intended for the carriage of butter. The vessel has a length b.p. of 215 ft. and a 6-cylinder B. & W. Diesel of trunk-piston type delivers 1,350 i.hp. at 155 r.p.m., giving the ship a speed of about 12 knots.

Here is an important bunch of ships carrying out fine and efficient duty on the Australian coast. It may be argued that they are smaller than the average run of coastwise ship used on the United States coast lines, which in itself lends force to the argument that U. S. shipowners are behind the times in neglecting to take up the Diesel for their new construction, even if we assume for a moment the argument that the most difficult ship today to fit with the Diesel engine is the small type of freighter, i.e., between 215 ft. and 350 ft. in length. If that problem has been overcome—as presumably it has been on the Australian coast—how much more easy should it be to overcome on the U. S. coastline with slightly larger vessels. Again it may be argued that the Australian shipowner can build abroad, which U. S. law prohibits the domestic owner from doing. It is true that he has this advantage, but even so, the cost of the domestic Diesel is not sufficiently high above the cost of the domestic steam engine to make it impossible for the owner using domestic Diesel engines with its tremendously superior economies to get back his money in a short space of time. Even supposing, again, that domestic shipowners do not feel that the time has yet arrived when they can say to their advisers—"We want the Diesel," then let them, at any rate, use every effort to follow what their opposite numbers in Australia are doing with such apparent success.

Costs $10,000 Less Per Round Trip Than Steamer

THE motorliner GRIPSHOLM'S 18,000 tons and greater capacity costs $10,000 less per round trip than the 12,000 tons of the steamer STOCKHOLM. This is the statement of G. Hilmer Lundbeck, U. S. and Canada managing director of the Swedish-American Company.

The GRIPSHOLM was the first motorship in transatlantic passenger travel and Mr. Lundbeck said the experiment had been more than justified. The original cost of a motorship is greater, but time has proved the cost of operation is well below that of the older type.

During the present year—from January to January—the Swedish-American Line will have carried 38,000 passengers, Mr. Lundbeck said. A year ago the total was 33,000 and in 1925 it was 24,000. Of this year's total only 8,000 were immigrants. The others were tourists, mostly Americans.

Advices have been received by the New York office of the Swedish-American Line that the passenger motorship KUNGSHOLM, now being built for the line, will be launched at the Blohm & Voss shipyard in Hamburg, February 18, 1928.

The new ship will be 608 ft. long, 79 ft. beam, 21,000 register tons and 25,000 tons displacement, and will be equipped with two eight-cylinder Diesel motors generating 24,000 hp. Accommodation will be provided for 250 first, 400 second and 950 third class passengers.

The new KUNGSHOLM will have the same general features as her sistership, the GRIPSHOLM, but in her will be embodied many remarkable and novel examples of the ship builder's craft and every latest improvement both as to power and passenger accommodation. She will be electrically lighted and powered throughout, electricity performing all lighting, heating and ventilation of cabins and other parts of the ship, even the kitchens being operated by electricity. As on the GRIPSHOLM, there will be a total absence of steam, smoke and dust—all combinations which have tended to make the Swedish American Line finish the best passenger year in its history, according to G. Hilmer Lundbeck, managing director in the United States and Canada. Not only did the passenger figures for 1927 set a record, but the freight business was much more than that of a year ago, he said.

The new motorship, KUNGSHOLM, which is being built in Hamburg, will make her maiden voyage in November, 1928, he said. She will be launched in February and will be the largest in the fleet with a tonnage of 21,000.

Ms. Augustus' Maiden Voyage

AUGUSTUS, 32,000 tons gross, which, when completed, will be for a while the largest and fastest motorship in the world, will start on her maiden voyage from Genoa on November 10 and will reach Buenos Ayres on November 24, the same duration of time as that occupied by the steamer GIULIO CESARE, of the same company. AUGUSTUS has been built by Ansaldo of Genoa, and will have accommodation for about 2,700 passengers and a crew of about 500. The four double-acting 2-cycle M.A.N. engines develop a total hp. of about 27,000.

Fast Australian Motorships

John Brown & Co., Ltd., Clydebank, Scotland, are building for the New Zealand Shipping Co., Ltd., London, three twin-screw Diesel driven passenger and cargo vessels, each 530 ft. in length, 70 ft. in breadth, and of about 15 knots service speed. These vessels, which take the place of the two large ships provisionally ordered in April of last year by the Federal Steam Navigation Co., Ltd., and the New Zealand Shipping Co., Ltd., will have Brown-Sulzer Diesels constructed by the shipbuilders.

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The Editorial Viewpoint

Motorshipping and Shipping Supremacy

DOES A NATION'S shipbuilding and shipping supremacy vary directly with her adoption, or otherwise, of motorships? Sir Alfred Yarrow appears to think so, and his name is one to conjure with in world shipbuilding circles. From the yard at Scotstoun on the Clyde, whose active control he relinquished on October 5 after sixty years of service, have come many of the most classic examples of the naval architectural and marine engineering arts. His slant on the present position of Great Britain among the maritime nations, according to an announcement he made at the time of his retirement is particularly clear-sighted and not without moral in that he attributes Great Britain's decline in shipbuilding supremacy in some measure to her lack of appreciation of the potentialities of the Diesel driven vessel. Tomorrow's freighters, he declared, will run under the power of Diesel engines. It is not, we would remind Sir Alfred, the freighters of tomorrow which will be Diesel powered, but the freighters of today—on all long ocean hauls—which are Diesel powered. All types and categories of ships now have their motor representatives. Great Britain's lack of enthusiasm over the motor driven ship is perhaps easily understandable because of the abundance of her coal resources. Great Britain will never be an enthusiastic motorshipping nation. She will inevitably be driven to become a motorshipping nation and may conceivably in time require to extract oil from her coal. Motorship building has tended to shift the "world center of gravity" of ship and marine engine construction. That is why you can go into the center of Switzerland and find a marine engine building firm with enough work for two years. . . Sir Alfred Yarrow's remarks are succinct. One cannot help thinking, however, that his own firm had never been particularly active in Diesel engine construction. It is men with the foresight of Lord Kylsant, world's largest shipowner, and Sir Frederick Lewis, owner of the magnificent Furness motorship fleets, who are responsible for the fact that Great Britain today owns some of the finest motor liners—cargo and passenger—in the world.

U. S. Grain in U. S. Motorships

IT IS WITH the smaller, general cargo, almost tramp type tonnage, that Great Britain will loose valuable trade if she does not more wholeheartedly adopt the Diesel. And it is just in this way that the United States will be placed in a good position as a potential world carrier if further schemes go forward for Dieselization of laid-up Shipping Board units. Granted that conversion is at the best a compromise, we must always remember that, with the care exercised on good laid-up units that was given to the TAMPA and her sister, an excellent general cargo fleet can be created easily able to compete with the ever increasing fleets of 11 knot Scandinavian motorships which carry such a large proportion of the world's grain cargoes today. Only by the fulfilment of a big conversion program can come to fruition the dreams of Chairman O'Connor of the Shipping Board that American grain and manufactures will be carried to its market in American bottoms..... Apropos of which, one may, perhaps, be pardoned for reminding Mr. O'Connor of a slip in his economic scheme outlined in a recent address at Georgetown University. "Other nations besides ourselves," he said, "have wheat for export..... They have their delivery trucks and we must have ours." Argentina, Canada, India, and Russia are the only big wheat exporting nations other than the United States and yet none of these countries exports its own wheat in its own bottoms. None of these countries, in other words, has its own delivery trucks. Wheat from all is handled by that big British-Scandinavian-Italian-Greek tramp group you can find at any time during the respective seasons at Rosario and Rio, Montreal, or Karachi, and in the majority of cases they have brought coal outwards from South Wales ports. Now, supposing that the majority of U. S. wheat can be exported in U. S. motorships, using one quarter the fuel of any foreign steam tramp? ..... Then surely in Mr. O'Connor's words—will U. S. grain get to world markets at just as low or at lower cost than the goods of other nations. Let us remember this and especially in conjunction with the fact that the motorshipping era is vitally different from anything that has gone before.

More Motorships Than Steamers Now Building

OVER half of the present shipbuilding of the world is being devoted to motorshipping according to returns of Lloyds Register of Shipping, the total of 1,589,000 gross tons comparing with that of 1,485,000 gross tons for all other types of vessels combined. Over 700,000 tons more ships equipped with internal combustion engines are now in hand than there were at this time last year, when the total for all countries, being constructed, was 869,000 tons.

The total i.hp. of oil engines reported for the quarter ended September 30, was 1,163,630. At the end of the June quarter the total for the world was given as 1,102,424.

For steam reciprocating engines, the present world total of 568,969 indicated horse power, represents a decline from the June quarter figure, which was 580,600.

California Oil Prosperity and Motorshipping

A STUDY OF trade routes at the present day shows how far reaching the influence of the motorship now is. This does not mean that the motorship has altered trade routes but that, as is pointed out on page 853 of this issue it has refined them. Corners are now being clipped off trade routes. The Panama Canal today is probably the world's busiest focus of motorshipping activity by reason of the number of routes converging on the canal. The oil companies in California and the port of Los Angeles can in no small measure trace their present prosperity to the Panama Canal and to the motorship services it carries. The principal round-the-world motorship services today use Panama or San Pedro for bunkering purposes, and many of the largest and fastest motor freighters now in existence take on board at San Pedro sufficient Diesel and lubricating oil to carry them quite round the world and back to San Pedro again..... Naturally competition to secure the cream of the lubricating oil and bunkering business is fierce, but after all when you come to analyze the situation closely, you find that it is largely competition which is responsible for the present excellent and efficient service given by companies engaged in trade between New York and the Far East. A considerable service is now developing, incidentally, between the Pacific Coast ports—Portland, Ore., Seattle, San Francisco, and Los Angeles—and the ports on the west and east coasts of the South American continent via Magellan. Here again, the service is a "round" one with bunkering for the round trip at Los Angeles or at the Canal. Furthermore in order that the trip may be a "round" one, the outward portion is made by way of the Straits of Magellan to the Argentine and Brazilian ports. From Brazilian ports the ships engaged in this trade—two of which have made record round trip passages—carry coffee on a fast schedule up to Pacific coast ports thus adding further competition to an already highly competitive route. Motorships have been the urge on this route and the result has been that the motorshipper now offers an excellent clean, reliable service to exporters of coffee, and all, of course, ultimately to the benefit of the Californian oil trade.

Pacific Coast New Type Motorships

IT IS NOT only in Pacific Coast—S. America trade that the motorship has its stranglehold on the steamer. The new fleet of four 13 knot Furness Withy motorships, specially designed for service between the Pacific Coast and Great Britain, when completed will have the effect of displacing all but one of that company's steamers in the trade and will witness the Dieselization, which of course is synonymous with modernization, of yet another freight carrying fleet unit. Pressure of competition

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from the fleets of other nations, coupled with the fact that even 13 knot steamers with their large fuel consumptions cannot hope to compete with motorships, has undoubtedly made the construction of this fleet a necessity. Furness Withy in any case are a very live concern and would be the last to lag behind in any new development. The interesting feature in these new ships of the PACIFIC RELIANCE class is the high standard of passenger accommodation provided. This includes paneled smoking lounges, tasteful drawing room, and attractive staterooms, far superior to those provided on many existing transatlantic steamers today..... Thus we see a new type of passenger cargo ship created retaining all the features of a first class cargo ship—with ample refrigerated space, in addition to clear 'tween decks for lumber, and center grain divisions for grain in the lower holds—to which passengers can be attracted, in a way they would never be attracted by a steamer, because the motorship is a cleaner, faster, more reliable proposition in every way. These new ships are in every way up-to-date and the arrival of the PACIFIC RELIANCE, first of the fleet, at the canal on October 7 may be said to have marked a new era in Pacific coast shipping.

Towards Simplification and "Workability"

THE MACHINERY of the new Furness Pacific liners is of a well tried single acting 4 cycle type from which the owners have had much satisfaction in the past..... While it is still a little early to dogmatize on engine types, there are nevertheless very definite indications that the number of marine oil engines on the market will in the near future become limited to those units definitely able to stand the wear and tear of practical operating conditions. Owners, moreover, are now beginning to get the feel of the particular type or make of engine suited to their individual requirements. It is conceivable, for example, that a make of engine suited to service in, or to and from one particular part of the world is not so suited to service in another part—and vice versa. Which is an interesting point in as much as it does not point to a limitation of the number of engine types for which there is a market but possibly a segregation of types into groups each suited for a particular service. Which, further, should be a matter of no small satisfaction to progressive manufacturers because motorshipping itself is tending to segregate, and each segregation is becoming a line of intense activity and competition. Simplicity, reliability, and "workability" must be the keynote of progression for all such manufacturers..... Most of the engine makes which were on the market two or three years ago and which have since disappeared owe their disappearance largely to some inherent complication in design which, while permitting of successful operation on the test bed by trained laboratory crews, have militated against sea operation with crews varying from good to average. Marine Diesel engine design has got to progress to a point where every engine sent to sea is fool proof, and not merely a laboratory model.

Judicious Publicity and Engine Progress

APROPOS OF the disappearance of certain makes of engines from the market, it is interesting to speculate how far the success of a particular engine is determined by the amount of publicity given to the performances of such an engine not only on trials but also during its subsequent performance at sea. One does not suggest that manufacturers should, as it were, go off at "half cock" and broadcast material of an immature nature concerning their products. One likes, nevertheless, to think of the real useful information to shipowners and designers alike which the Shipping Board has disseminated by the publication of the 30-day test reports of the marine oil engines constructed for their first conversion program, now rapidly approaching completion. These reports have been definite records of what the engines accomplished. They showed that the engines were uniformly good and thereby reflected great credit upon the manufacturers concerned. Subsequent performance records of the ships—all of which have been readily available—have substantiated this. Once an engine, and later the ship in which it is operating, have proved successful, there appears to be no useful purpose in making difficult the publication of records concerning the ship's performance and of descriptions of the ship itself. Such withholding of information often leads to the circulation of incorrect and dangerous rumors. On the other hand, information which is released should always be of unimpeachable accuracy..... It is a significant, yet definite, fact that the company with the largest output of marine Diesel engines today is the one which most readily circulates information regarding its every activity. It has an almost perfect publicity service. On the other hand a company which initially published most extravagant claims for its engine has never yet built one of such engines..... That, engine manufacturers, should give you serious food for thought.

The New Furness Withy Motorships

EVENTS MOVE FAST in the motorshipping world. No sooner do we hear of the Linea Sud Americana's (Garcia & Diaz, New York) ambitious building program of two 18-knot motor passenger cargo liners and three 14-knot motor cargo vessels for service between New York and the East Coast of South America, than there comes what appears to be a quick and effective reply from other interests concerned in trading to these ports. MOTORSHIP announced two issues ago that Furness Withy Co., were considering the construction of some new fast passenger cargo vessels. Further details on these are now to hand and Sir Frederick Lewis shed interesting light on some new contracts at the Annual Meeting of Prince Line Ltd., which was held this month in London.

"It is increasingly apparent to the directors"—he said—"that in the principal trade routes where commodities of high value are carried, speed is the most important factor. In particular, in the trade to which I refer, foreign competitors are introducing motorvessels of a speed which will shorten the voyage several days and after full consideration we decided to replace our existing vessels with fast and up-to-date motorships. We designed the vessels for 16 knot service speed to be equipped in every way for the requirements of the trade."

A study of the trade routes upon which Furness Withy interests are paramount would appear to show that the New York-South America trade is very likely the one indicated and in view of the recent announcement of the ambitious Garcia & Diaz (i.e. Linea Sud Americana) program this would seem all the more obvious. Very little data has been released as yet either on the new Garcia & Diaz ships or on the new Furness ships. The new vessels of the Prince Line will be twin-screw boats with a double-acting, 4-cycle Diesel on each shaft. Since a speed of 16 knots is aimed at it is fair to assume that the hp. developed cannot be less than 8000 and we imagine that in all probability two 6-cylinder engines will be fitted for main propulsion, in addition, of course, to the usual all-electric auxiliaries.

We have recently gone on record as stating that the 16-knot cargo liner would not become general for several years. The placing of these recent contracts would appear to support this statement because the vessels when completed will be for a special trade and of special type which cannot be copied by every general cargo ship owner.

The greatest difficulty in designing these new Furness Withy vessels, Sir Frederick Lewis tells us, was to embody the ideals of speed and modernity in the ships, and at the same time to avoid the capital cost outstripping their economic justification. It should be noted in this case, however, that a guarantee under the British Trade Facilities Act has been obtained. This recent activity is definite proof of the fact that competition in motorshipping has now become extremely active and therefore for every good ship ordered by one company a better ship is ordered by her rival. Surely those people who have the betterment of the steam engine at heart will indeed have a tremendous fight before them to compete with such advancement as this.

Coal Shipper Orders Motorships

Those vitally interested in the progress of motorshipping will have every reason for self-congratulation when they find that Sir William R. Smith of a well-known Cardiff Shipping company interested vitally in coal handling has just concluded negotiations for the construction of two motorships, one an 8600 tons vessel to be built and engined by Doxfords of Sunderland. Steam will be eliminated throughout on this ship—even the auxiliaries being electrically driven. Cardiff is one of the strongest strongholds of the steamship today, and it is a matter of some interest which some people would like to call "The Writing on the Wall" that such an order should be placed.

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Powering Large Passenger Liners

REPRODUCED herewith is a list of seven recent motor-passenger liners, even a brief glance at which is sufficient to show what great strides have been made in this direction in the last few years. The list is not arranged in chronological order but in order of sizes, but it is interesting to recall that the AORANGI which went in service early in 1925 had a gross tonnage of 17,491, whereas the AUGUSTUS, now approaching completion, has a gross tonnage of 32,000. The AORANGI'S total shaft horsepower was 13,000, whereas that of the AUGUSTUS is 28,000. AORANGI had four 6-cylinder, 2-cycle, single-acting engines; AUGUSTUS has four 6-cylinder, 2-cycle, double-acting engines. The cylinder diameter in each case is the same. The AORANGI has 39 in. stroke and the AUGUSTUS has 47.2 in stroke.

2-cycle, double-acting layout in that it absorbs too great a proportion of power for scavenge purposes. Even the 4-cycle, double-acting school is rent within itself on the respective merits of attaching or not attaching injection air compressors to the main engines.

The BERMUDA would appear to present an attempt to find yet another solution to the problem. The 2-cycle, opposed piston engines with which she is fitted, are of well-known type which have given every satisfaction in many existing ships. Many people would consider that it is a daring proposition to fit four such engines with such a large numbers of reciprocating parts in a passenger ship and then expect no vibration; but we are sure that every effort has been made to overcome this and that the BERMUDA, when she goes in service, will

pleased is the fact that shipowners are beginning to take such interest in the Diesel-propelled passenger liner of up to 30,000 hp. Beyond that it is a little difficult to predict what may happen or if, say, a 50,000 hp. motorship is ordered, how the problems will be met. Many people seem to think that this is where Diesel-electric drive will step in and help us.

Motor Passenger Liners' Passenger Distribution

	Gross Tons	Speed	Passengers 1	2	3	4
A Augustus	32,000	20	300	...	...	....
B Saturnia	23,900	19	279	257	309	1352
C. Asturias	22,500	16	475	190	800	....
D Gripsholm	17,300	16	129	482	1006	....
E Aorangi	17,491	17	440	300	230	....
F Christiaan Huygens	16,000	17	533		62	52
G Bermuda	17,000	17	616	75	...	....

Comparative Sizes of Recent Large Motor Passenger Liners

	Name	Service	Reg. Dims. Ft. L.	B.	D.	Tonnage	No. of Pass.
A	Augustus	Genoa-S. America	664.5	82.6	42.5	32,000 G.	2,178
B	Saturnia	Trieste-S. America	599.0	79.5	45.5	23,900 G.	2,197
C	Asturias	S'ton-S. America	630.0	78.0	45.0	22,500 G.	1,465
D	Gripsholm	Gothenburg-New York	550.0	74.0	42.5	17,300 G.	1,617
E	Aorangi	Vancouver-Sydney	580.0	72.2	46.6	17,491 G.	1,000
F	Christiaan Huygens	Rotterdam D. E. Indies	550.0	68.5	39.7	16,000 G.	647
G	Bermuda	New York-Bermuda	550.0	74.0	45.0	17,000 G.	691

Comparative Machinery Sizes of Recent Large Motor Passenger Liners

	Name	Total Power	Speed	No. of Engs.	Ins. Bore	Ins. Stroke	R.P.M.	Type	No. of Cyls.
A	Augustus	28,000 S.*	20	4	27.5	47.2	125	2-cyc. D. A.	6
B	Saturnia	20,000 B.	19	2	33.1	59.1	125	4-cyc. D. A.	8
C	Asturias	15,000 B.	16	2	33.1	59.1	115	4-cyc. D. A.	8
D	Gripsholm	13,750 S.	16	2	33.1	59.1	125	4-cyc. D. A.	6
E	Aorangi	13,000 S.	17	4	27.5	39.0	127	2-cyc. S. A.	6
F	Christiaan Huygens	11,600 B.	17	2	27.0	47.0	115	2-cyc. S. A.	10
G	Bermuda	11,200 B.	..	4	24.0	41.0 lower 24.0 upper	110	2-cyc. O. P.†	4

* Extreme rating—probably normal rating 25,000 b. h. p. at 120 r.p.m.
† Airless injection opposed piston engines with unequal piston strokes.

A study of the table giving details of machinery would appear to indicate that while the Diesel engine is definitely established for all but the most mammoth of passenger liners, there still exists a widely diversified opinion as to the best way of powering ships of up to 40,000 hp. Of the key examples shown three ships are powered by 4-cycle, double-acting engines, two by 2-cycle, single-acting engines, and one by 2-cycle, double-acting engine. The most interesting example of all perhaps is the BERMUDA which has 11,200 b.hp. given by 2-cycle, opposed-piston engines with unequal piston strokes. These engines operate at 110 r.p.m.

One of the great problems which marine Diesel engineers have to face in the immediate future is this business of powering large passenger liners. The owners of such ships are now quite definitely sold on the idea of Diesel engines for their ships but it is evident that they do not know yet which particular type of machinery to fit. Some people are wedded to the idea of the 4-cycle, double-acting principle, but 2-cycle, single-acting opponents will tell them that the big 4-cycle double-acting engine is too big. Other people again will criticize the

be one of the steadiest motorliners in existence.

An ineresting comparison is possible between the 11,600 hp. CHRISTIAAN HUYGENS and the 13,000 hp. AORANGI. The former has two 10-cylinder, 2-cycle, single-acting engines of 27 in. cylinder diameter and 47 in. stroke running at 115 r.p.m. AORANGI has four 6-cylinder engines of 27½ in. cylinder diameter and 39 in. stroke running at 127 r.p.m. The engines with which both these ships are fitted represent one of the best known makes of 2-cycle engines now on the market, an engine which can now be made in powers of 1000 hp. output per single-acting cylinder unit. It is understood, however, that the owners of the CHRISTIAAN HUYGENS especially desired to have 10-cylinder units in order to make parts readily interchangeable.... Here are some well-known existing ships and here are different ways in which engineers concerned have interpreted their powering problems. Each has its own merits and possibly demerits and it seems unlikely that we shall get down to standard methods of propulsion for such ships for the next few years. The main feature over which the industry as a whole should feel

Bunker Oil Bids

Bids for bunker oil for Shipping Board vessels operating in Pacific waters, which were opened in San Francisco, have recently been considered. The proposals were for 4,800,000 barrels of oil for delivery at San Pedro for use by vessels at Atlantic-Gulf ports and at Pacific stations.

The bids were as follows: The Richfield Oil Company, of Los Angeles, bid 83 cents per barrel on 750,000 barrels for bunkers at San Pedro, 76½ cents per barrel on 1,300,000 barrels cargo oil for use in Atlantic-Gulf stations, and 78½ cents a barrel on 2,750,000 barrels cargo oil for use in Pacific stations.

The Associated Oil Company, of San Francisco, bid 83½ cents per barrel on 1,000,000 barrels of cargo oil for use in Pacific stations; Shell Oil Company, of San Francisco, bid 84½ cents per barrel on 1,000,000 barrels of cargo oil for use in Pacific stations; General Petroleum Corporation, of Los Angeles, bid 85 cents per barrel on 1,000,000 barrels of cargo oil for Pacific stations; Pan American Petroleum Company, of Los Angeles, bid 90 cents per barrel for 750,000 barrels for bunkering at San Pedro and 84 cents per barrel for 2,750,000 barrels of cargo oil for Pacific stations.

California-Petroleum Company, of Los Angeles, bid 85 cents per barrel for 750,000 barrels for bunkering at San Pedro and 85 cents per barrel for 275,000 barrels of cargo oil for Pacific stations; Union Oil Company, of Los Angeles, bid 94 cents per barrel for 750,000 barrels for bunkering at San Pedro, 86 cents per barrel for 1,300,000 barrels of cargo oil for Atlantic-Gulf stations and 86 cents per barrel for 2,750,000 barrels of cargo oil for Pacific Coast stations; Standard Oil Company of California submitted a proposal to supply the full requirements at market prices at time of delivery, subject to maximum of $1 per barrel.

Goodrich Cutless Bearings are fitted on the motor yacht COMOCO illustrated and described on pages 786-7 of our October issue.

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Ms. Ashbee and Jacksonville Sold to Kerr Interests

Price of $34.50 per ton dw. Ships Will Inaugurate a New Transpacific Service

THE American motorships JACKSONVILLE and ASHBEE have been sold to the Kerr Steamship Co., who, it is understood, will place them in the Pacific Coast-Far East service of the Silver Line. The ASHBEE and JACKSONVILLE are well equipped motor freighters of 5500 tons dw., each propelled by a 6-cycle 1500 hp. A. B. B. Werkspoor Diesel. They were built as steamers and were converted by the American Brown Boveri Corp., Camden, N. J., in 1923 and 1925 respectively. Lately they have been in S. America trade. Before the sale they were owned by the Ashbee Motorship Corporation, which was organized about 3 months ago by Joseph Meseck, president of the Meseck Towing Co. For several weeks shipbrokers offered the vessels for sale in the New York market and they were finally disposed of to the Kerr interests.

In connection with the above, the following formal announcement has been made by General Steamship Corporation of San Francisco:

"With the addition of two American motorships to the present Silver fleet, the Kerr Lines will inaugurate another new service from the Pacific Coast to the Orient.

"These vessels will call at Seattle and San Francisco and will proceed to Singapore, Madras and Calcutta, returning via Belawan and Honolulu. They will furnish shippers of Pacific Coast lumber, petroleum products, canned goods, automobiles and manufactured products a much needed direct service, comparable to the service now afforded by the Silver motorships in the Pacific-Java-Calcutta service from Los Angeles and San Francisco to the East Indies and Calcutta. On the homeward run, moreover, they will enable importers of gunnies in Hawaii, San Francisco and Seattle to receive their shipments direct, eliminating transshipment that has heretofore been necessary. This also applies to pig iron, linseed, bone-meal and other products from India, as well as the East Indies."

This marks another progressive step taken by the Kerr Lines since their entry into the Pacific trade in the last year.

First of these was the inauguration of a new direct service to the East Indies and to Calcutta last January; the next involved the new refrigerator service started in August, now carrying large quantities of Pacific Coast fresh fruits and vegetables to the Orient, Java and Singapore. Now comes a third step, involving the extension of the Kerr Lines to Seattle through inauguration of this new line."

The new service out of the Northwest and San Francisco will be inaugurated in December and will be on a bi-monthly basis.

Second Atlantic Refining Co.'s Diesel Electric Conversion

SHARON, Diesel-electric tanker for some time under process of conversion for the Atlantic Refining Company, was given its trials during the week ending October 22 and is now on the way south to the Gulf to pick up its first cargo. This is the second of the three conversions to Diesel-electric drive which has been completed for the Atlantic Refining Company, the first boat, POINT BREEZE, having recently returned from its maiden voyage to Europe.

The three boats were purchased from the United States Shipping Board and the drive was changed over under the personal supervision of L. M. Goldsmith, technical engineer of the Atlantic Refining Company. MS. POINT BREEZE, first to go in service, was reconditioned by that company at its Point Breeze plant, while the SHARON and BESSEMER were converted by the Alabama Dry Dock & Shipbuilding Company at Mobile, Alabama. The recent trials of the SHARON took place at Mobile, including dock and sea trials, and the tanker immediately left Mobile for Beaumont, Tex.

All three boats will probably be operated in coastwise service, but may occasionally be used in foreign service between American ports and South Africa or Europe. The former propulsion was of steam type, but the new power plants each consist of Ingersoll-Rand Diesels—engines and electric equipment furnished by the General Electric Company. Each tanker is equipped with three 850-hp., 225-r.p.m., Diesel engines, each driving a 525-kw., 250-volt generator for propulsion and a 50 kw., 250-volt auxiliary generator for excitation and ship's auxiliary power. The propulsion generators supply power to an 1800 hp., 90 r.p.m., 750-volt, double motor on each boat, direct connected to the propeller shaft. The control is of the variable voltage type arranged for operation either from the pilot house or the engine room, the control panels being of dead-front type.

The tankers are fitted with electric auxiliaries all of which are driven by General Electric motors. The auxiliaries include two 80 hp. cargo pumps, one 45 hp. windlass, one 30 hp. mooring winch, one 30 hp. fire and bilge pump, two 15 hp. air compressors, a balancer set and numerous small pumps—as well as a 25 kw. auxiliary generator driven by an oil engine for emergency use in port.

A novel feature is embodied in the POINT BREEZE, latest addition to the Atlantic Refining Company's Diesel-electric fleet of tankers fleet, which has just returned to Philadelphia from a successful maiden voyage to German and Belgian ports. The heat contained in the exhaust gases from the engine cylinders serves to generate steam for heating the heavy cargo oils to facilitate their flow through the pipe lines in unloading. No oil fired boiler, such as is often employed on tank steamers, is thus necessary.

Sun Shipbuilding and Drydock Corp., Chester, Pa., have launched the big motor tanker SUNOIL. The vessel has a deadweight carrying capacity of 10,000 tons, will be operated by the Sun Oil Co., and is propelled by Sun-Doxford Diesels.

Society of Naval Architects and Marine Engineers

The thirty-fifth General Meeting of the Society of Naval Architects and Marine Engineers will be held in the Engineering Societies Building, 29 West 39th Street, New York City on Thursday and Friday, November 10 and 11, 1927. Professional sessions will begin at 10 A. M. each day.

Prior to the General Meeting, the Council of the Society will meet at 3 P. M., Wednesday, November 9th, in the Board Room on the 15th floor, Engineering Societies Building, through the courtesy of the American Society of Civil Engineers.

Hudson River Night Line to Build Motorships

As we close for press we are able to announce that the Hudson River Night Line is to construct two Diesel driven ships for automobile carrying on its New York-Troy-Albany service. This order when placed will represent one of the most welcome orders American marine Diesel builders have had to bid on for some time. It will represent the breaking open of the door to a field of activity whose potentialities MOTORSHIP has consistently preached—that of the small coastwise, bay, and sound ship. The Hudson River Night Line wanted ships for up-to-date automobile carrying between New York and up river points—an ever increasing traffic in view of the conjestion existing around the bridges, ferries, and roads leading out of Manhattan. The Diesel engined ship, on the grounds, of economy, efficiency, and reliability of service, was the obvious solution to the problem.

Mr. Crosby, general manager of the line, tells us that the new ships will be fast—16 knots. They will have a length of about 300 ft., a beam of 50 ft. (overguards presumably as the ships must have a "V" section) and a depth of hold of 16 ft.

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The Trend of Marine Oil Engine Design

A Sketch Showing Something of the Factors Which May Influence Shipowners in the Choice of an Engine

FOR the first time on record motorships now under construction exceed the steamers—a fact which affords excellent opportunity to review the tendency of design and consider what type of engine the shipowner finds best in service. Five years ago one particular design of 4-cycle engine predominated with about 40 per cent-50 per cent of the total engine power then on order, while the remaining orders were divided among 30 or more different designs, the majority of which were the 4-cycle type. The 2-stroke engine was only represented by some 10 per cent of the total. At that date the shipowner was in the position of a man who goes to his first race and sees that all the horses look much alike. He does not know on which to put his money. There was only the one horse that he had seen running and that of course was made prime favorite.

Types Now Building

Various venturesome spirits backed outsiders some of which came home and some did not. The result of the experiences of the past five years are shown by the latest returns; the poorly "trained" have dropped out and only two or three designs, most of which are the product of builders who have had the longest experience have survived. An examination of the present figures will show that the four stroke design mentioned above now has about 30 per cent of the power on order. This 30 per cent however, represents many more orders than did 40 per cent five years ago. One design of the 2-cycle engine takes approximately another 30 per cent as against 5 per cent five years ago. Of the remaining 40 per cent about 35 per cent is divided among two or three designs and the only 5 per cent to the outsiders on which one or two ship owners are still willing to put their money.

The above figures indicate very clearly the tremendous jump forward in the favor of the shipowner that the 2-stroke design has made.

Single or Double Acting

No details have been mentioned above of the subdivision between single and double acting engines that has taken place during the last year or two. The most popular stroke design is now built either as a single or as a double acting engine according to the power required. One other 4-stroke engine has met with some success in service, two satisfactory 2-cycle designs have been put into service, while other experimental engines show considerable promise for the future. On the other hand several of the highest powered engines on order are of the 2-cycle single acting type and some people now think that the highest powers that are likely to be required in future can be developed by this type of engine, at the expense possibly of somewhat higher first cost and weight but with a great saving in upkeep due to the simpler and more accessible design of the single acting as compared with the double acting engine.

The development in the power of the 2-stroke engine during the last few years has been truly remarkable and promises to be even greater in the future. Five years ago few if any engines had a power higher than 300 b.hp. per cylinder. Now a single acting engine of about 700 b.hp. per cylinder has been running for some time and three ships with considerably over 1000 b.hp. per cylinder will shortly be put into service.

Large Engine Design

Due to the limitations imposed by the design of the bottom end of the cylinder the double acting engine has not yet in some people's opinion developed to sizes that might be expected. Remember, too, that the largest double acting 4-cycle engine on order is about the same size as the 2-cycle single acting acting engine mentioned above. The 2-cycle double acting engine has not yet reached that size for marine work although a land engine of somewhat larger size has been in service for some time carrying peak loads in a generating station. The difficulty in the design of large engines is chiefly due to heat stresses which cause damage to pistons and cylinder covers in many cases and these items fix the limit to cylinder diameter that may be employed. The simpler and more symmetrical the design of cover and piston the larger is the cylinder that can be built. The design of these parts in the single acting 2-cycle engine allows of a cylinder of at least 40 in. diameter, and satisfactory experiments have been carried out as engines of this size. The 4-cycle engine single or double acting appears to have a limit at about 35 in., while the lower cylinder will probably limit the double acting 2-cycle engine to an even smaller diameter than 35 in. for although the cover is less complex than that of the 4-cycle engine the rate of heat flow will be considerably greater. It appears therefore that for very high power the 2-stroke single acting engine may hold its own against rivals.

While the tendency in Europe has been steadily towards higher powers per cylinder, development in America may be working towards the multiplication of units of comparatively low power, driving the propeller through electric power or gears. In both of these spheres America leads the world and it is undoubtedly a line of progress which when fully developed will have a great following everywhere, though at present it is only in its infancy and in none of the plants yet built has it been possible to obtain the maximum advantage from the indirect type of drive by the use of really high speed light weight engines which are now being developed.

In Europe there has been a very distinct movement towards standardization by manufacturers. Most of them have adopted one or two standard cylinder sizes and obtain a wide range of power by altering the number of cylinders, for example, the Sulzer engine with cylinder 680 mm. in diameter developing 500-600 b.hp. per cylinder is built in units of from one to eleven cylinders. The 11-cylinder engine is being built for the Hamburg American line who have had several 6-cylinder engines of the same cylinder dimensions and presumably wish to keep to that size of cylinder for larger powered engines so that spare gear will be interchangeable. About half the engines of Sulzer design now building are to be fitted with cylinders of this size. Similarly Burmeister & Wain have adopted a cylinder of about 400 hp. as a standard to which the majority of engines of their design are built.

Fuel Injection

On the question of fuel injection, design has not been standing still. Until Doxford introduced a successful solid injection system the atomization of the fuel was carried out by air in every engine of large size. Several previous designs fitted with solid injection had all failed to give satisfactory results, the combustion generally being such that the impression of the ship at sea was very similar to that given by a destroyer putting up a smoke screen. It was some time before Doxford's example was followed by other builders but the introduction of the double acting engine gave solid injection a good boost, as it was found very difficult to fit a satisfactory air injection system to the bottom end of the cylinder. Now there are a considerable number of satisfactory airless systems in use and the number of their adherents is likely to grow. The saving in cost and weight by the abolition of the air compressor being a very attractive bait to any but the most conservative engine builder.

Steam's Last Stronghold

The only stronghold of the steam engine in which the Diesel engine has as yet only obtained a slight foothold in the North Atlantic fast passenger trade, and if certain proposals now on foot materialize this last trench of the die-hards is likely to be successfully stormed and taken within the next year or two. One 25-knot Diesel ship running between Europe and America will be enough to cause drastic modification in the policy of all the important passenger lines. The passenger himself will see to that for he is not slow to appreciate the greater cleanliness of the Diesel engined ship.

Four Motor Tankers in 18 Months

Another Standard Götaverken motor tanker has been launched. She is being built for the Waages Tankrederi A/S, Oslo, has a designed deadweight carrying capacity (including fuel oil) of about 9000 tons, and will be fitted with twin-screw six-cylinder 1400 i.hp. Götaverken-B. and W. oil engines. She is the fourth Götaverken tanker to be constructed in 18 months.

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Contracts Let for Diesel-Electrification

Three Ships to Be Re-Built, Involving Construction of Electrical Propelling Equipment and Diesels Totaling 15,360 Hp.

CONTRACTS for what amounts to a complete re-building of the steel cargo steamships COURAGEOUS, DEFIANCE and TRIUMPH to Diesel-electric motorships have been awarded to the Federal Shipbuilding Company, the Norfolk Navy Yard and the Boston Navy Yard, respectively. By means of conversion the service speed of these vessels will be advanced from approximately 10 knots to an estimated service speed of between 13 and 14 knots, thereby bringing them into line with the speed requirements of modern freighters on long haul ocean routes.

The amounts of the contracts are as follows: COURAGEOUS, $1,319,000; DEFIANCE, $1,192,000, and TRIUMPH, $1,315,000, a complete list of the bids submitted by eight shipyards being summarized below. These figures are stated to be about 60 per cent of the estimated cost of constructing new vessels of this type in American shipyards, and less than the cost of constructing similar high-speed freight ships in foreign shipyards.

The three ships selected for conversion will have a deadweight of about 10,500 tons so the cost of conversion will work out at between about $119 and $131 per ton dw. The TAMPA, the first Shipping Board motorship cost $60 per ton dw. It would appear that the estimate of 60 per cent of a new ship is a little generous. From figures before us it would seem possible to equip a new vessel in an American yard for practically the same price as is now being paid for the conversions. In a foreign yard this would be much cheaper. This does not however detract from the value of the contracts to the engine builders and to the one private yard fortunate enough to get a contract. It marks another real live step to place the American merchant marine on a firm basis. General Electric equipment will, we understand be fitted to the COURAGEOUS. One of the other two ships will have Westinghouse equipment while the third ship's equipment maker has not yet been decided on.

Latest information to hand, as we go to press, is indefinite as to the engine contract awards. A persistent rumor, however, has it that the vessels will be equipped with four McIntosh and Seymour Diesel engines each, the cost of which is included in the contract prices. Each engine will be an 8-cylinder trunk piston unit rated at 1280 b.hp. at 250 r.p.m. with a 20 in. cylinder diameter and a 24 in. stroke. A total of 12 engines will be constructed.

NAME OF BIDDER	AMOUNT OF BID SUBMITTED			NAME OF DIESEL BIDDER	PROPULSION MOTORS AND GENERATOR BIDDERS	DELIVERY
	1 SHIP	2 SHIPS	3 SHIPS			
	Defiance	Total of each Triumph and Defiance	Total of each			
Norfolk Navy Yard	$1,128,045	$2,214,011	$3,346,745	De La Vergne 6 cyl.	General Electric	1 ship 75 d. after motors or 10½ m. 2 ships about 12½ m. 3 ships about 14½ m.
		1,107,006	1,115,582			
Federal	1,248,000	2,396,000	3,546,000	De La Vergne 6 cyl.		
		1,198,000	1,182,000		General Electric or Westinghouse	1 ship 3 m. after receipt of all main mach. (about 11 m.)
	1,333,000	2,538,000	3,726,000	Busch-Sulzer		
		1,296,000	1,242,000	8 E. E. 21		
	1,334,000	2,534,000	3,726,000	New London	Builders option	2nd ship 2 m. after first.
		1,267,000	1,242,000	4 or 6 cyl.		
	1,338,000	2,552,000	3,747,000			3rd ship 4 m. after first.
		1,276,000	1,249,000	McIntosh & Seymour		
	1,388,000	2,656,000	3,924,000	Busch-Sulzer		
		1,328,000	1,308,000			
Boston Navy Yard	Triumph	Triumph and Defiance				
	1,249,895	2,452,954	3,666,428	De La Vergne or		
	Triumph	1,226,477	1,222,143	Bessemer	General Electric or Westinghouse	1st ship 10 m. 2nd ship 13 m. 3rd ship 16 m.
	1,333,895	Triumph and Defiance				
		2,617,594	3,910,868	McIntosh & Seymour		
		1,308,797	1,303,623	8 cyl.		
Sun Shipbuilding Co.	Triumph 1,388,000			Bessemer 8 cyl.	General Electric or Westinghouse	10 weeks after receipt of all main mach. (6 to 13 m.) or 8½ to 15½ m.
	Triumph 1,398,000			De La Vergne 6 cyl.		
	Triumph 1,467,000			Norberg 5 cyl.		
	Triumph 1,525.000			Busch-Sulzer		
	Triumph 1,543,400			Ingersoll-Rand 6-cyl.		
Staten Island Ship Co.	Triumph 1,450,000	Bid on one ship only. $6,000 for Defiance	Increase $15.500 for Courageous	De La Vergne	Westinghouse	3 m. after receipt of all main mach.
	Triumph 1,500,000			New London or Busch-Sulzer 8 cyl.	(Add $6000 for General Electric).	
	Triumph 1,510,000			McIntosh & Seymour		
	Triumph 1,560,000			Busch-Sulzer 6 cyl.		
Bethlehem	Triumph	Triumph and Defiance	(Unsatisfactory qualifications			
	1,510,000	2,970,000	with all bids).	McIntosh & Seymour		1st ship 12 m. 2nd ship 14 m.
		1.485.000				
	1,560,000	3,070,000		Busch-Sulzer 8-cyl.		
		1,535,000				
Morse D. D. Co.	Triumph 1,553,000			De La Vergne	Westinghouse	4 m. after delivery of mach. or 12½ m.
Tietjen & Lang	1,666,156			Bessemer or De La Vergne	General Electric or Westinghouse	11 m.
	1,724,522			Fulton		11 m.
	1,728,726			New London		13 m.
	1,744,083			Nordberg. Busch-Sulzer or McIntosh & Seymour		11½ m.

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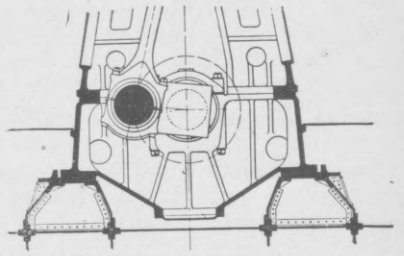
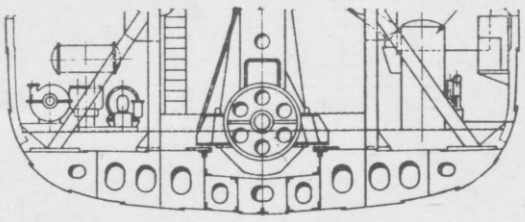
The Question of Tank Tops

THE Diesel engine has now reached a point in its development where it is having very definite effects on the structure of ships in which it is fitted. From time to time we have previously touched on how this is altering accommodation layouts and deck arrangements, but literally and figuratively, the effect is deeper than this—no deeper however than that most important position of the ship known as the tank top. Half the trouble that Diesel engineers have had to face in applying their engines to ships, has been due to lack of realization on the part of shipbuilders as to how exactly these new type marine prime movers were to be housed in the ship in the best way.

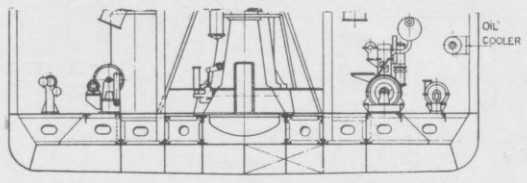
New style tank top in construction



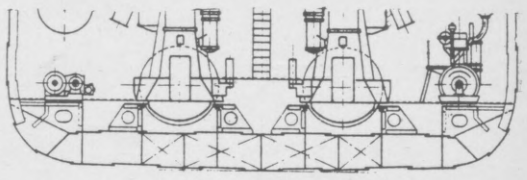
Girder construction on tank top



New style tank top—engine sits flush



Engine foundation built up to form "false" tank top



Engine foundations built up on tank top

In the earlier days when we were still thinking of steamer construction the plan was generally to lower the engine on the tank top on specially prepared girders built on to the tank top as the illustration shows, or to incorporate these in the tank type structure possibly by running up intercostals through the tank floor. This practically is now becoming "vieux jeux," and the illustrations which we reproduce show something of this. Whereas formerly the tank top was in effect extended upwards to take a crankpit of the Diesel, the whole tank floor is now raised beside the Diesel and sunk in way of the crankpit. The Diesel, therefore, is now lowered literally on to the tank top, but it is not the old style tank top but a new, deeper, raised, and strengthened tank top fully able to take care of all the stresses which the rapidly rotating prime mover puts upon it.

It would be interesting if some of our readers could tell us exactly who first thought of it. Possibly like so many innovations of real value it occurred to a whole heap of people at the same time. We saw typical examples of its application while visiting the Harland & Wolff yards at Belfast recently, and were enabled thereby to secure the picture reproduced above. The sections through the machinery space which we reproduce also above are of those of ships fitted with a well-known make of single-acting Diesel.

The New Hamburg American Motorships

Will Introduce in 1928-29 Powerful Competition on North Atlantic and Pacific Coast Trade Lanes

THE motorships SAN FRANCISCO, LOS ANGELES, SEATTLE and PORTLAND will be placed in the Hamburg-Pacific Coast Service, and the motorships ST. LOUIS and MILWAUKEE will be plying between Hamburg and New York.

The motorships SAN FRANCISCO, LOS ANGELES, SEATTLE and PORTLAND will be installed with 12 rooms with two berths each, in all 24 berths, in Cabin Class, and 7 rooms accommodating in all 24 passengers in the Third Class, while the motorships ST. LOUIS and MILWAUKEE will carry in addition to a Cabin and Third Class a Tourist Third Cabin. The passenger accommodations for the last two motorships in the Hamburg New York Service will be about 400 berths in the Cabin Class, about 300 berths in the Tourist Third Cabin, about 400 berths in the Third Class.

In addition to the dining saloons, smoking saloons and ladies' saloons spacious promenade decks will be provided on all motorships. Hot and cold running water in the Cabin Class and running water in the Tourist Third Cabin and Third Class on the ST. LOUIS and MILWAUKEE will also be a feature. The other four motorships will have running water in the Cabin Class.

NAME OF MOTORSHIP	BUILDER DELIVERY DATE	DIMENSIONS LENGTH	DIMENSIONS REAM	DIMENSIONS DEPTH	GROSS REGISTER TONS	SERVICE SPEED
Pacific Coasters						
San Francisco	Deutsche Werft Hamburg Spring, 1928	430 ft. 0 in.	59 ft. 0 in.	37 ft. 9 in.	6,500	13 knots
Los Angeles	Deutsche Werft Hamburg Spring, 1928	430 ft. 0 in.	59 ft. 0 in.	37 ft. 9 in.	6,500	13 knots
Seattle	Deutsche Werft Hamburg Summer, 1928	461 ft. 9 in.	61 ft. 0 in.	30 ft. 2½ in.	7,300	14 knots
Portland	Bremer Vulkan Vegesack Summer, 1928	461 ft. 9 in.	51 ft. 0 in.	30 ft. 2½ in.	7,300	14 knots
North Atlantic Ships						
St. Louis	Bremer Vulkan Vegesack Winter, 1928	*———	———	———	16,000	16 knots
Milwaukee	Blohm & Voss Hamburg Spring, 1929	541 ft. 4 in.	72 ft. 2 in.	45 ft. 3 in.	16,000	16 knots

*Dimensions probably as Milwaukee.

According to the Merchant Fleet News published by the U. S. Shipping Board, the motorship WILLIAM PENN recently discharged 160,624 bags of raw sugar, totaling approximately 10,000 tons, in 63 working hours.

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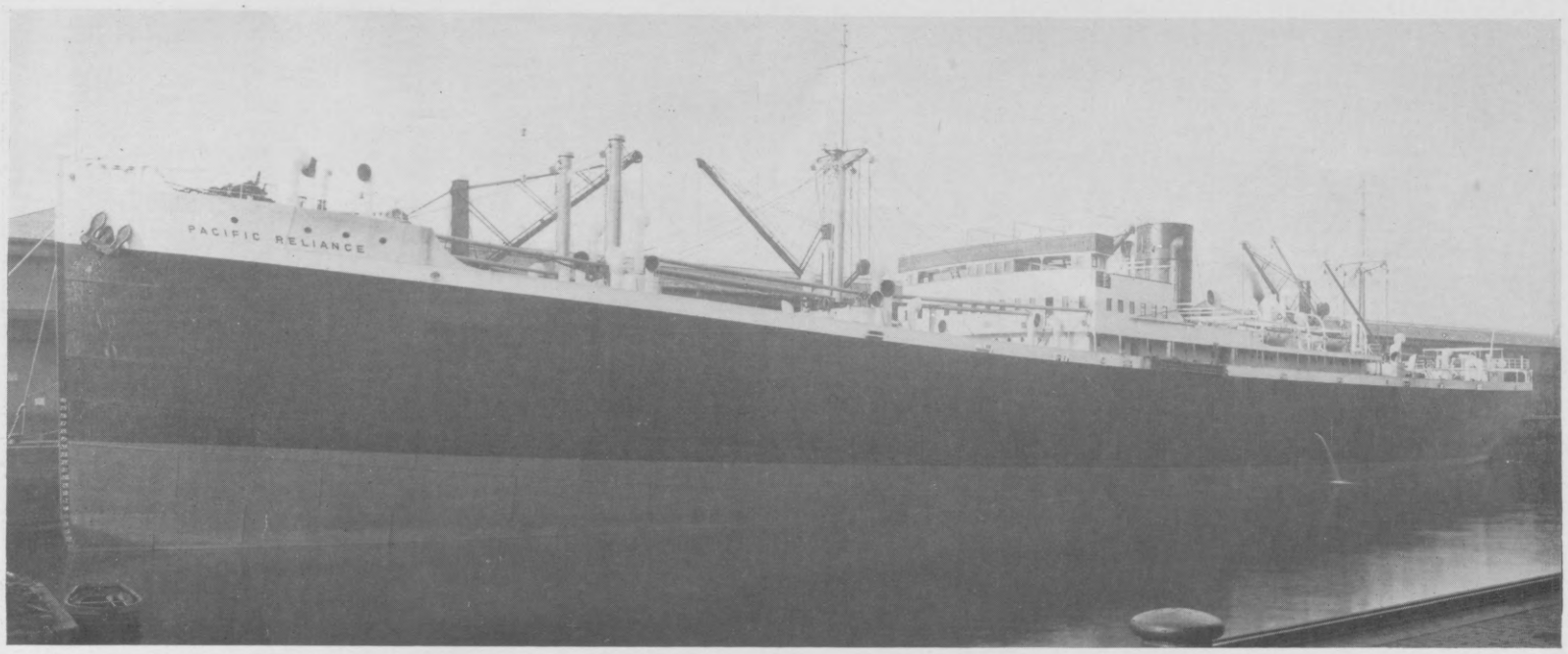


First of a New Pacific Motorship Fleet

Ms. Pacific Reliance Now Maintaining Pacific Coast-U. K. Service Is First of Fleet of Four, Powered by 4,200 Hp. 4-cycle Diesels

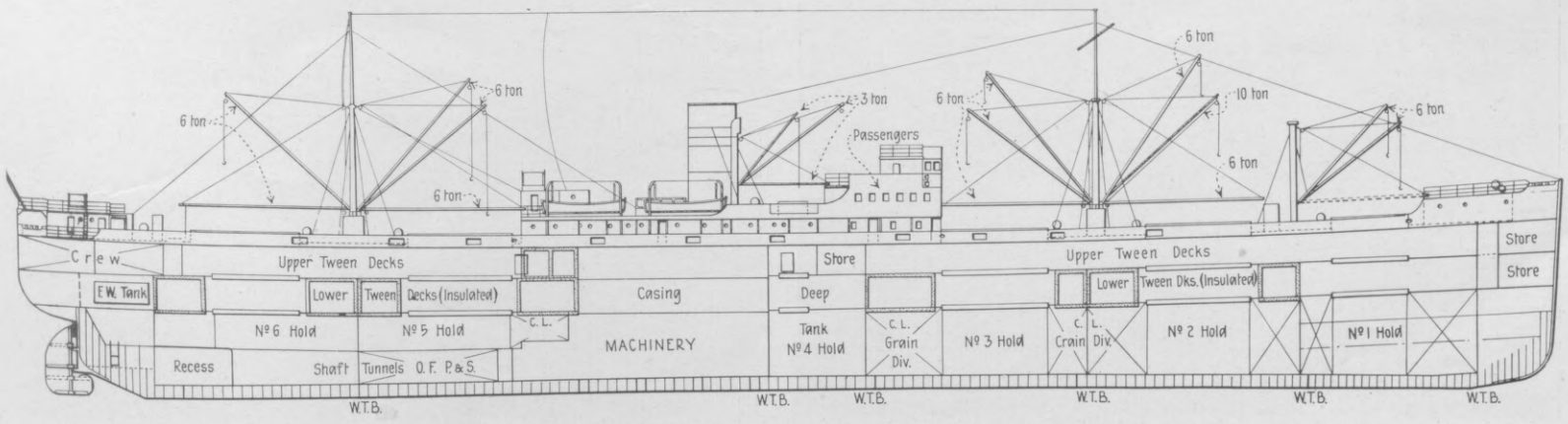
COMPETITION in the Pacific Coast—U. K.-Continent trade has, since its inception, never been more active than at the present time. This trade is of particular interest because it is one in which the motorship may be said to be displacing the steamer almost entirely. Competition has inevitably brought in its wake an increase of speed and operating efficiency in the carriers concerned. This increase of speed has very naturally resulted in attempts on the part of the operating companies to attract passengers, with the most up-to-date type of ship available—the motorship. The latest example in this direction is MS. PACIFIC RELIANCE, first of a fleet of four fast motorvessels, (shortly to be increased to six) which have been put in service by the Furness Withy Company for trade between the rich Pacific Coast areas of America, and Manchester England. These four ships are intended to displace steamers which have been originally operating on the trade, and will presumably run alongside some slower motorvessels which have been in this service for some time. The construction and placing in service of these vessels seems to be in line with the progressive policy adopted by the Furness Lines when they replaced the whole of their New York-Far Eastern steamship fleet by fine 14½ knot motor-freighters, which is being continued by the placing in service of one of the most up-to-date motorliners in existence on the New York-Bermuda run, and which may shortly be consummated by the construction of further fast vessels of intermediate nature for New York-S. American service.

Characteristics of Ms. Pacific Reliance

Length b.p.	451 ft. 0 in.
Beam mld.	60 ft. 0 in.
Depth mld. to shelter dk...	42 ft. 0 in.
Draft (load)	27 ft. 0 in.
Deadweight	10,000 tons
Total power	4200 b.hp.
Sea speed	13 knots

MS. PACIFIC RELIANCE is a shelter deck vessel of 10,000 tons dw. on a 27 ft. draft. The whole of her accommodation for engineers, deck officers, stewards and 12 passengers is situated in one single house amidships, on the top of which is a large promenade deck for passengers, a screened in promenade and well fitted out smoking room, and social room. The crew is accommodated aft. There are in all six holds including one deep tank and there are two tiers of 'tween decks, the lower 'tween decks in each case having insulated space for the carriage of California fruit. The upper 'tween space is clear of bulkheads and well adapted for the carrying of lumber such as one finds usually in Pacific Coast trade; while the lower holds are well adapted for carrying grain, center grain divisions being fitted.

Interesting construction is noticeable in the tunnels, which take the line and tail shafts from two sets of B. & W. Diesel engines built by John G. Kincaid & Co., Greenock, Scotland, aggregating 4200 b.hp. collectively at 115 r.p.m. Each tunnel is a separate unit on its respective side of the ship so that there is a definite space between the two tunnels which can very



Inboard profile of the modern Diesel freighter Pacific Reliance, specially designed to transport U. S. Pacific Coast Produce to U. K.

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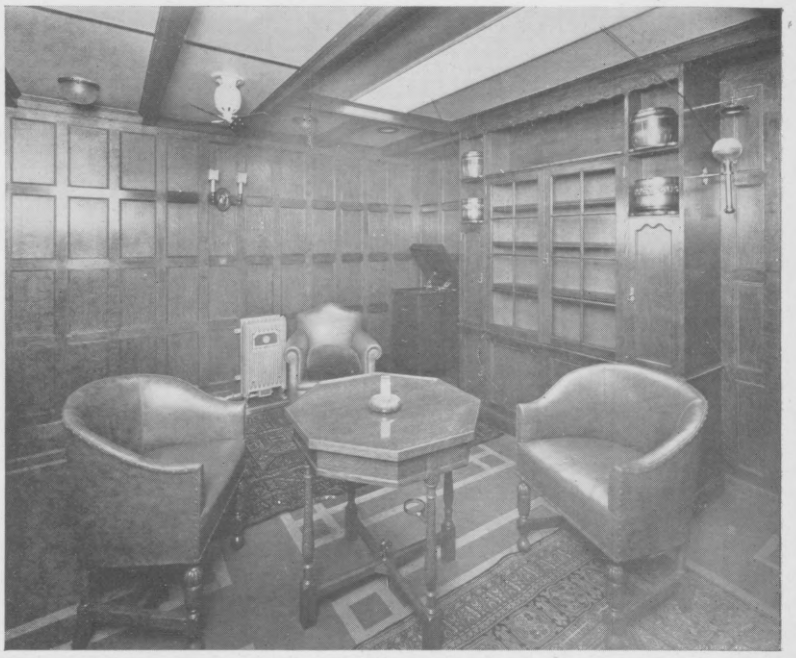
Elegance and comfort are reflected in the drawing room



Smoking lounge shows high standard of passenger accommodation

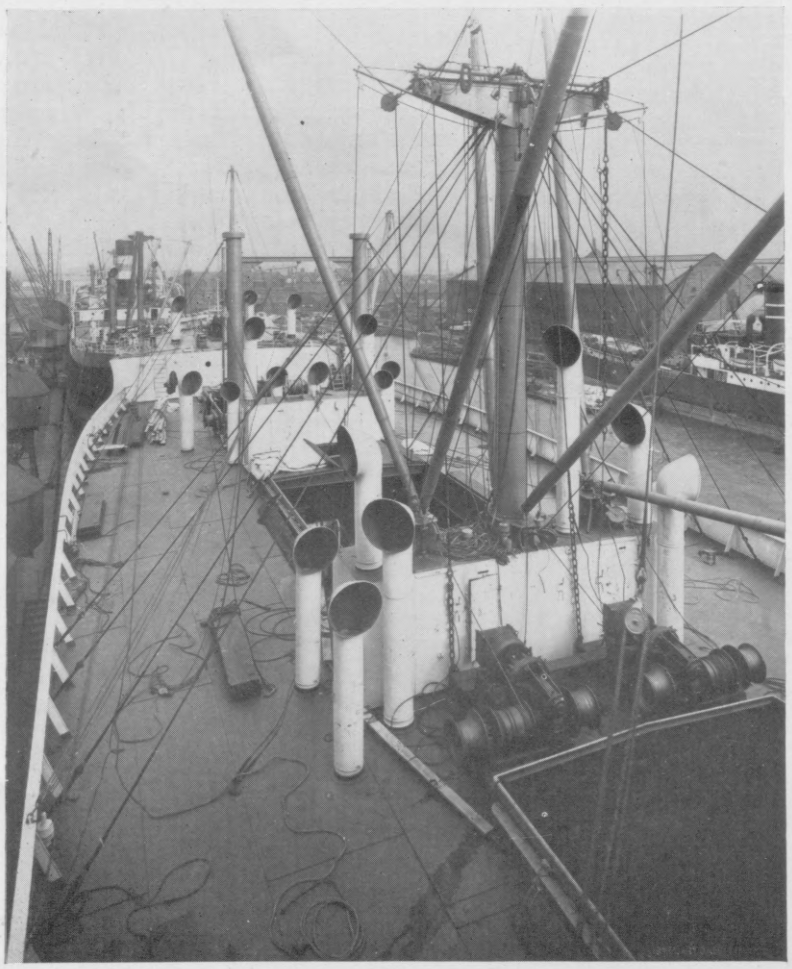
usefully be occupied by grain cargo. The motor room is situated slightly abaft and amidships and contains the main and auxiliary propelling machinery, all of which latter is electrically driven, current for this purpose being supplied by three 165 kw. Diesel-driven generators.

Each of the two propelling engines has eight cylinders with a bore of 25 in., and stroke of 51 in., developing 2100 b.hp. at 115 r.p.m., the twin installation giving a loaded speed of 13 knots on an approximate fuel consumption of 20 tons a day for all purposes. In the course of the test trials these engines had a fuel consumption of 0.414 lb. per b.hp. hr. at 111 r.p.m., and 0.435 lb. at 115.3 r.p.m. They showed an average mechanical efficiency of 76 per cent. at the same test, the m.i.p. at 115 r.p.m. being 6.92 atmospheres, and at 110 r.p.m., 6.36 atmospheres. Exhaust temperatures were 740 deg. Fahr. at 110 r.p.m. and 800 deg. at 115.3 r.p.m.

A three-stage air compressor, built by John G. Kincaid & Co., Greenock, provides air for starting and injection. All the auxiliaries, including deck machinery, are electrically operated, three generating sets of 165 kw. each, and driven by 4-cylinder Harland-B. and W. engines, giving ample power with adequate reserve. At the after end of the engine-room is a horizontal duplex engine for cargo refrigerating purposes, whilst a smaller machine is used for domestic supply.

Main engine pistons are oil cooled and the cylinder jackets are sea water cooled, exhaust gases passing through a Clarkson thimble tube boiler used for general hot water service. Starting air at 325 lb. per sq. in. is used and blast air injection pressure is 530 lb. per sq. in. The double bottom fuel storage capacity is 1450 tons.

All the deck auxiliary machinery is electrically driven, there being on the fore-



Modern cargo handling appliances for rapid handling of freight

Wide upper decks permit of passenger promenades

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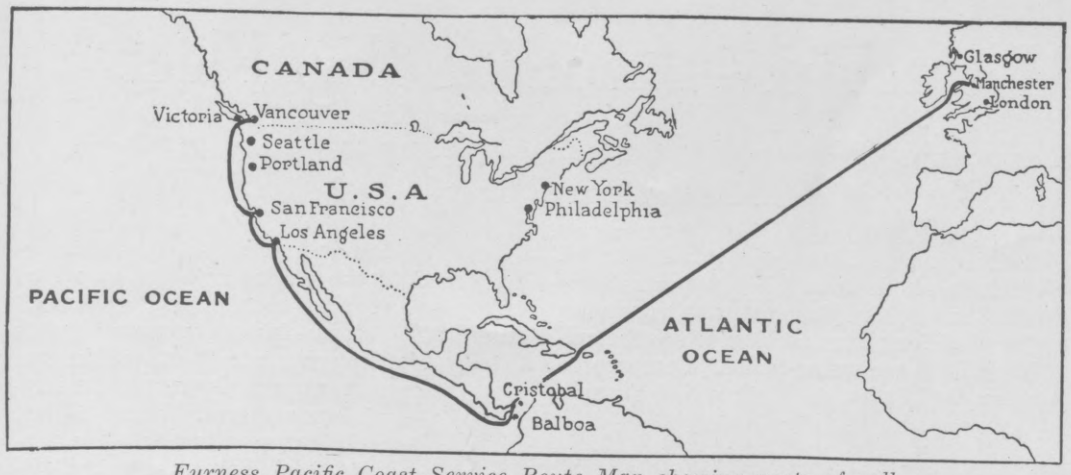
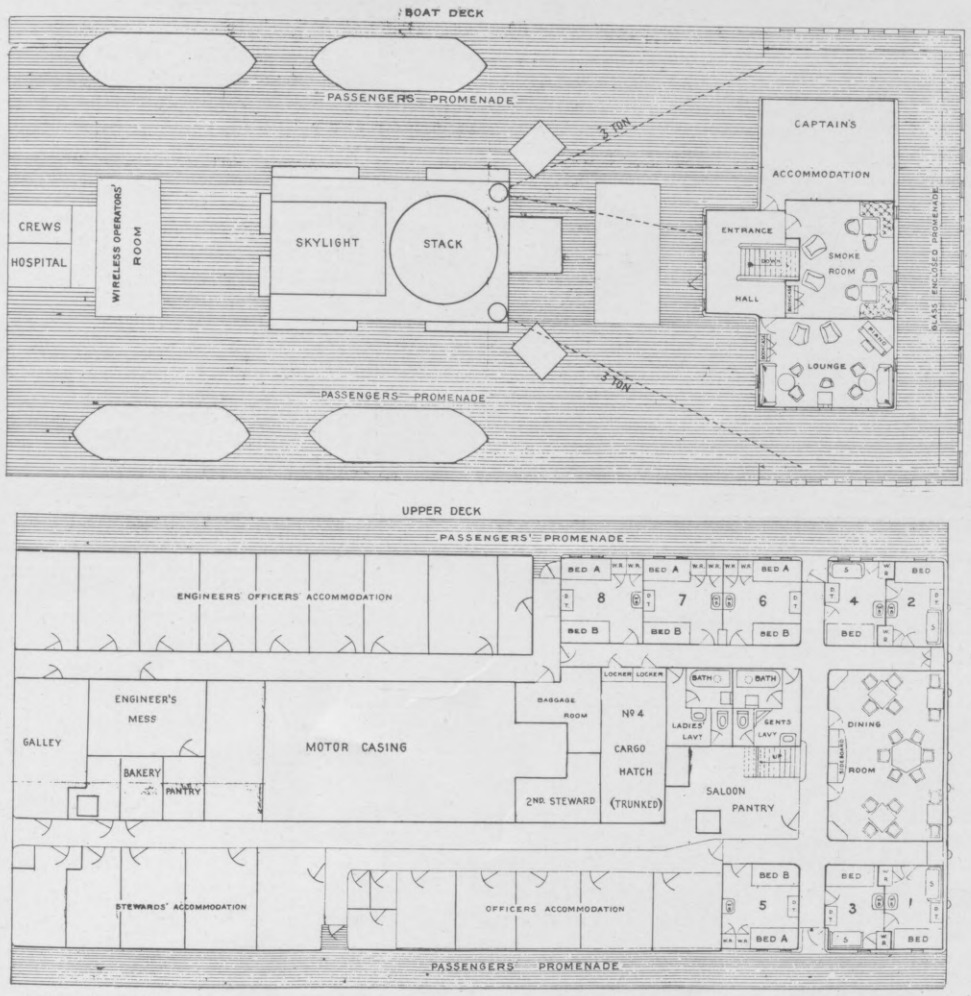
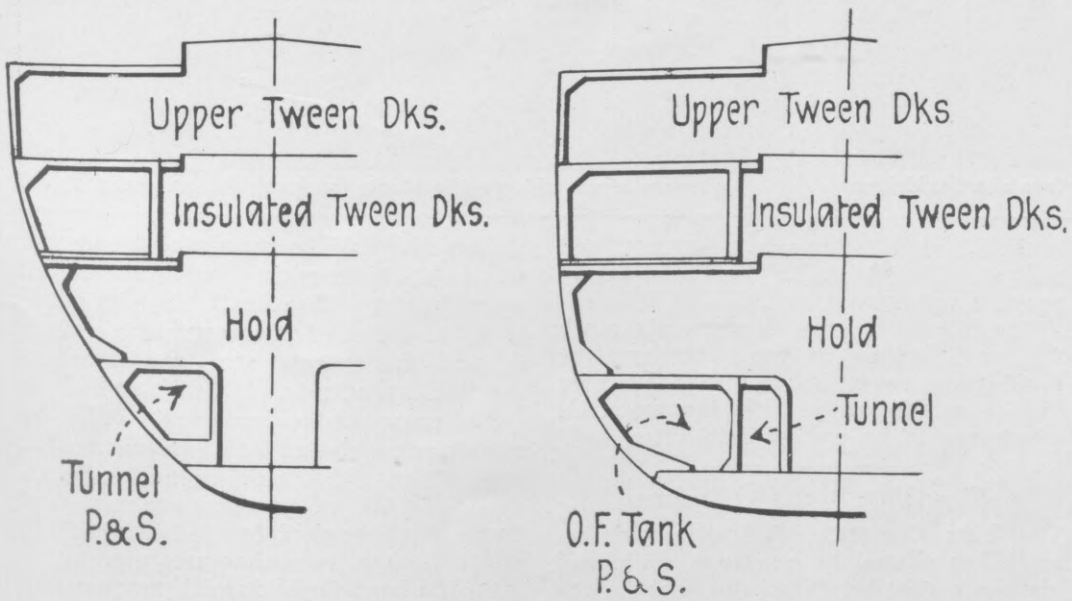


Furness Pacific Coast Service Route Map showing ports of call Advantage is taken of cheap bunkering facilities at the Canal



Comfortable passenger accommodation is provided on the upper and boat decks



Sketches showing interesting construction in way of shaft tunnels

mast, five 6-ton and one 10-ton booms, on the main mast five 6-ton booms, while on sampson posts forward serving No. 1 hatch there are two 6-ton booms. The decks are clear and well suitable for handling a wide range of cargo. The winches themselves, as is more usual in British practice, and in which British practice lags somewhat behind American practice, are mounted on the shelter deck itself between the hatches and not on raised platforms.

The hulls of the ships of this new fleet are being constructed by The Blythswood Shipbuilding Co., Scotstoun, Glasgow, and their construction has been overlooked by E. W. Harvey, Superintendent-engineer of the Furness Lines.

PACIFIC RELIANCE sailed from Manchester on her maiden trip on Sept. 23rd. and reached Panama Canal on Oct. 7th. Her sister ship, PACIFIC ENTERPRISE, is scheduled to leave Manchester on Nov. 30th, while the PACIFIC PIONEER leaves on December 30th. When the whole of the new ships are in service it is planned to have one sailing every ten days between United Kingdom and Pacific Coast ports by ships of the Furness Line. When all four ships are completed the Furness Company will have seven motorships in the trade as against three last year at this time. Each ship has about 75,000 cu. ft. of refrigerated or air-cooled space. Their arrival on the Pacific Coast and subsequent performances will, we feel sure, be watched by all shipping men with considerable interest and the ships may be taken as an indication of the way in which shipowners are definitely believing that by means of motorships, they can give the fastest, cleanest, quickest and most superior service to their customers.

Another Pacific Coast Motorship

Ms. MODAVIA, the new 12-knot refrigerator vessel of the Donaldson line, recently completed her first trip to the port of Vancouver, B. C. The liner was originally designed for the chilled and frozen beef trade from the South American ports to the United Kingdom. She was later transferred to the newly established service to the North Pacific coast of North America.

The 'tween-decks of the ship are fitted for general cargo, or for cattle. There are steel stalls equal to the finest in modern cattle ranch barns, providing accommodation for 900 head of cattle. These stalls are so arranged that when necessary they can be hung from the roof of the deck, and thus provide floor space for general goods.

The refrigeration system is of the most modern type and the ship can carry frozen, chilled, or air cooled freights. She has capacity for 4375 tons in her refrigerator space alone.

A feature of the vessel is the accommodation for officers and crew which is entirely amidships. The mess room, chart room, and other quarters compare very favorably with first class passenger accommodation on the largest liners.

The newly converted Shipping Board motor freighter SEMINOLE, fitted with a 4-cylinder H.O.R.-M.A.N. double-acting 2-cycle Diesel made nearly 14 knots in Ambrose Channel on Oct. 27. She was light ship and trimmed by the stern.

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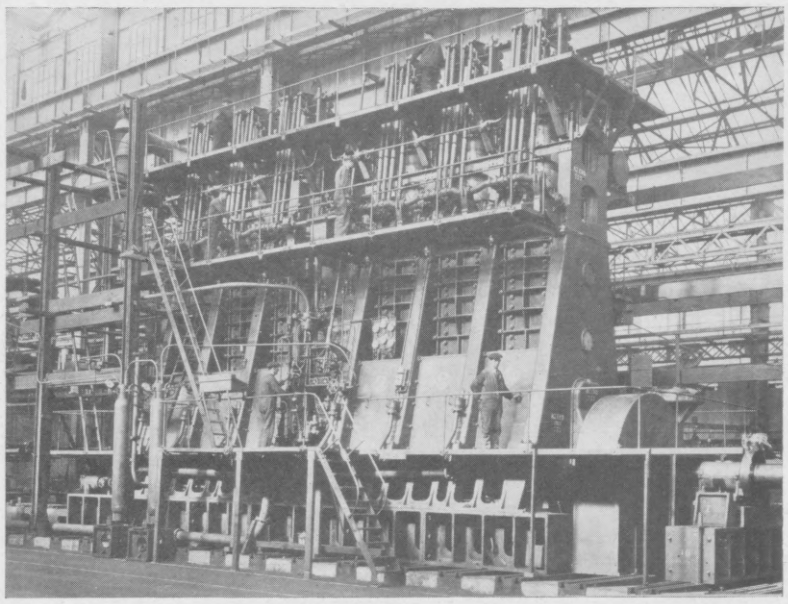
First of Nine Motorships—Another Big Fleet

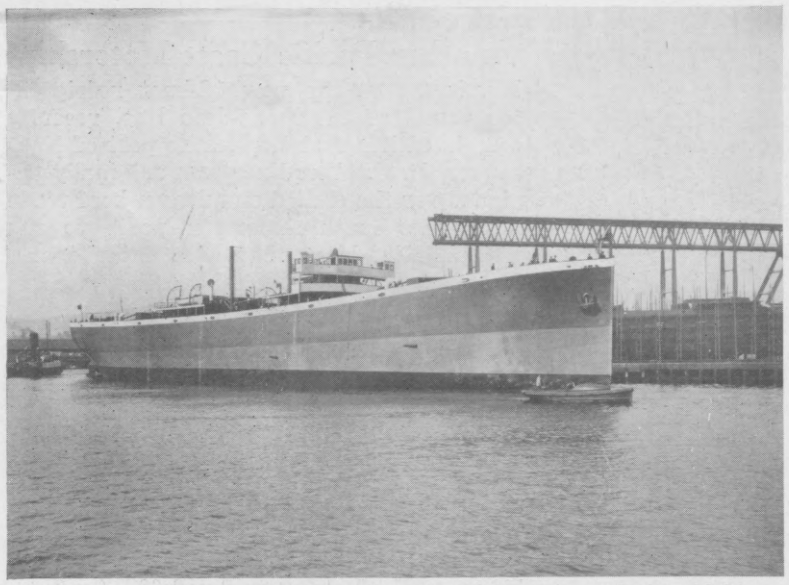
General Cargo Motorships of Up-to-Date Design Completing to Take Over Duties from an Existing Steamer Fleet

MS. KING EDGAR, first of the nine motor cargo vessels of 8,000 tons ordered from Harland & Wolff, Belfast, by The King Line, London, was launched on Thursday, September 9, and was followed on September 29 by the KING EDWIN, the second of the series. The KING EDGAR has been constructed to Lloyd's 100 A1 class. She has a straight stem and a cruiser stern, and her principal dimensions are:—Length b.p., 400 ft.; breadth moulded, 54 ft. 6 ins.; depth 34 ft. 8 ins.; gross tonnage 5,130 tons. The double bottom extends the whole length of the ship, and is arranged for carrying oil fuel, lubricating oil, fresh water, and water ballast. There are seven w.t. bulkheads, dividing the vessel into eight watertight compartments. The five cargo holds are served by ten derricks worked by ten 3-ton electric winches, and the hatches are of sufficient capacity to meet the British Board of Trade requirements for carrying grain. The masts are of the telescopic type, and are suitable for navigating the Manchester Ship Canal. The propelling machinery consists of one Harland-B & W. 6-cylinder, single-acting Diesel engine. The engine has forced lubrication throughout. Oil is used for piston cooling, while the cylinder jackets are water-cooled. Compressed air for fuel injection is provided from a 3-stage air compressor mounted at the forward end of the engine and driven off an extension of the crankshaft. A small emergency steam-driven compressor is fitted. Maneuvering air is stored in two steel reservoirs at a pressure of twenty-five atmospheres. Three 65 kw. electric generating sets are provided, each driven by a two-cylinder, four-cycle Diesel engine fitted with a special compressor for charging the maneuvering air resevoirs. A small vertical oil-fired boiler is installed for generating steam for emergency and other purposes.

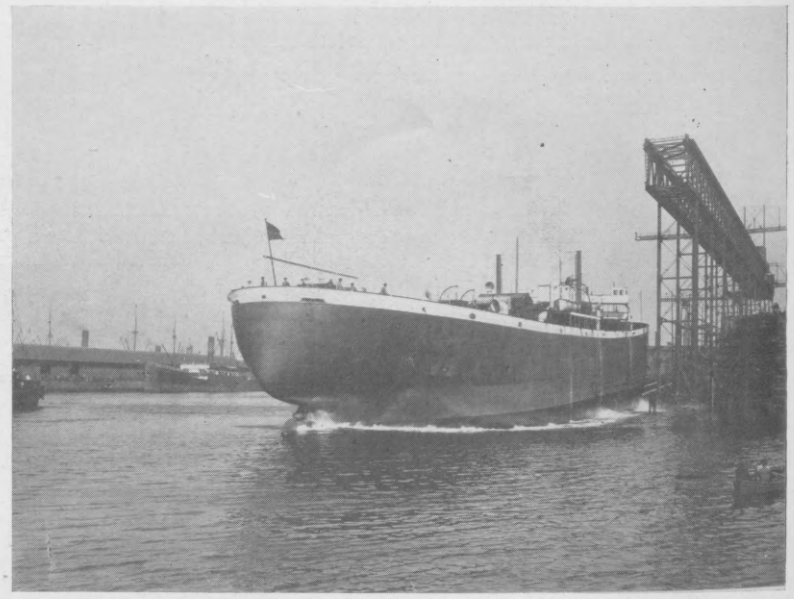


Six-cylinder single-acting 4-cycle main propulsion Diesel

These vessels are intended primarily to replace an existing fleet of nine general cargo "tramp" type steamers of about the same size and when all completed will increase the strength of the King line to 11 motorships, two existing motorships having been built in 1925. The new ships, which are particularly well-designed ships of general cargo (i.e. grain-coal-lumber type) belong to a company controlled by Lord Kylsant—hence its progressiveness and realization of modern requirements.



Ms. King Edgar is of shelter dk. type with engines abaft midships



Cruiser stern adds to the ship's workmanlike appearance

Harland & Wolff Motorships

The Harland & Wolff Belfast shipyards are well occupied with a representative collection of motorship types which they are constructing and fitting out. The largest vessel under construction is the 26,000 ton motorliner for the White Star Line, for which the most powerful marine Diesels yet constructed at Belfast are being built. Next in point of size are four Nelson liners, each of about 15,500 tons gross. Five of these vessels are on order, and all are to be fitted with double-acting Diesels of the same type as those which are doing so well in the Royal Mail Company's ASTURIAS and ALCANTARA and the Union-Castle Company's CARNARVON CASTLE.

The Nelson liners are apparently much farther forward than meets the eye, for rapid progress is being made elsewhere in the establishment with the materials which are to be worked into them.

New Fire Boat for Tacoma

The Foss Company of Seattle and Tacoma has offered to construct, equip and operate a 1000 hp. Diesel fire boat for the Port of Tacoma. Under the plan advanced, the vessel would be maintained ready for service at all times at a cost to the city of approximately $75 a day. The city would have the option of purchasing the craft at the end of a specified time and of operating it independently.

The proposed fire boat would be of the most modern design and equipment, with two 500 hp. full Diesel engines and a capacity of 6,000 gal. of water per min. Two pumps would be used, one delivering 150 lb. and the other twice that pressure.

Such a boat would furnish much needed protection to the expanding waterfront.

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The Motorship in Relation to World Trade Routes*

A Survey Descriptive of the "Refining" Effect of Motorshipping on Ocean Trade Routes, with Special Reference to Services Routed via the Panama Canal

WHEN a change takes place in the accepted method of propulsion for mercantile vessels, it is accompanied by changes in the geography of trade routes. This does not necessarily mean that the demands for and supplies of certain commodities cease, but that because the change in mode of propulsion is invariably accompanied by an increase in speed or efficiency, a different route becomes available. Improvements in the operating efficiency of the ship are due directly to the marine engineer and bear directly upon the change of trade routes, but the maritime history of the last hundred years has shown that maritime geography has also been changed in no small measure by the explorer and the civil engineer.

When all cargo carrying was done in sailing vessels, the "express" trade routes were limited to those regions of the oceans in which good prevailing winds aided the fine-lined ship. With the coming of steam and the mechanically propelled ship, "express" trade routes could be created wherever there was a demand for "express" cargo. The mechanically propelled ship, too, was responsible in some cases for opening up sources from which fresh "express" cargoes were obtainable.

The opening of the Suez Canal had the effect of restoring the Mediterranean to a position of importance because through "main lines" to the East and to Australia were routed via Gibraltar and Malta. The same is true of the Caribbean and the Panama Canal, with this difference, that whereas Suez was opened at the beginning of the steamer and coal age, Panama belongs essentially to the oil and the motorship age. Both the steamer and the motorship have in turn affected maritime geography but each in a different manner. When the steamer began slowly to displace the sailing ship, a period of intense colonial activity was in progress and even America could not manufacture sufficient for her ever-growing needs. The demand everywhere was for British manufactured goods and for British coal. Pioneer trade routes had to be established and in many cases the steamer was responsible for opening up new territory as we have mentioned.

Panama—the Pacific Coast—U. K. Link

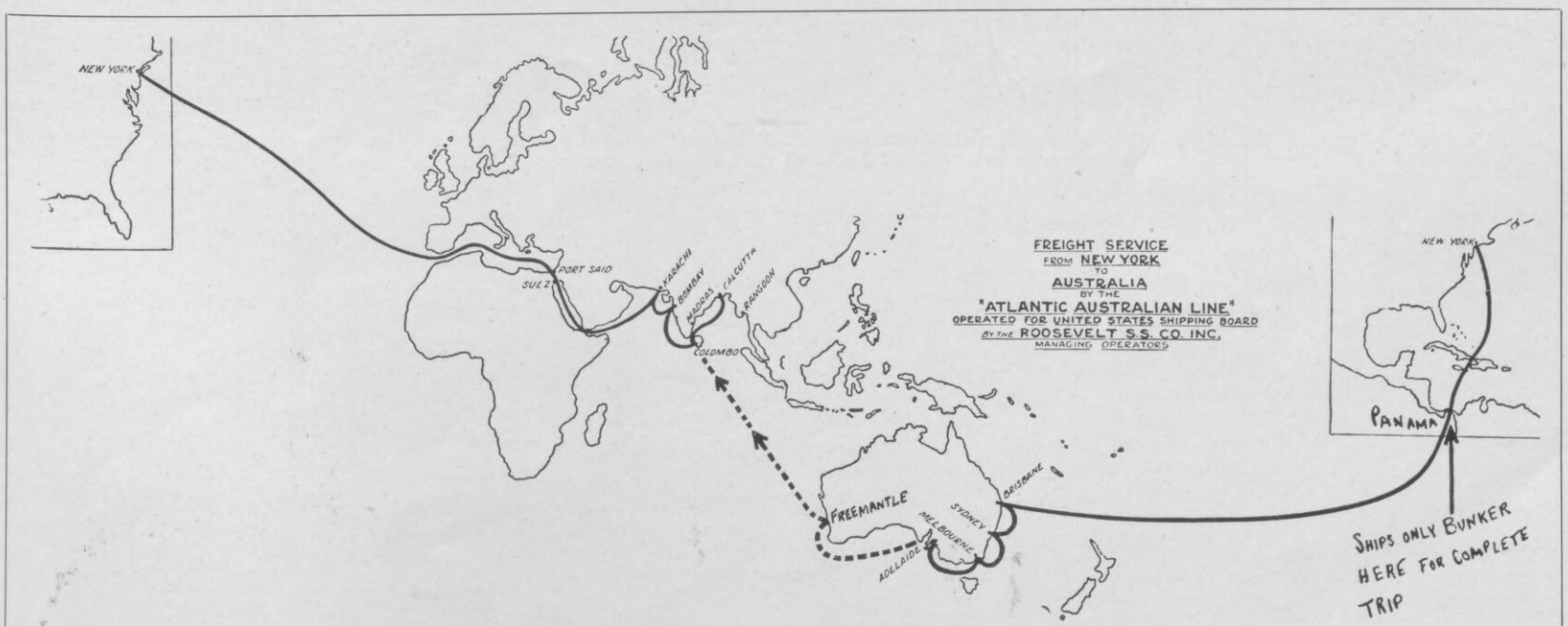
The Diesel-engined ship, now firmly established, has been born into a commercially sophisticated world—a world with definite zones of supply and zones of demand—a world from which much of the old pioneering spirit has gone because there is now very little need for it. The influence of coal is paramount no longer, and its place has been taken by oil. This factor alone has influenced maritime geography to a considerable extent commercially as well as strategically—commercially, because the positions of oil bunkering stations are not necessarily those of coaling stations, and in order to secure cheap bunkering facilities a shipowner may find it advisable to re-route his motorship, strategically, because a naval station once convenient for a steamer route may be too far from a motorship route for warships to operate from it in a patrolling capacity. Also the naval base situated ideally as a coaling station may be quite inadequately-placed as an oil-bunkering depot. The effects of trade route alterations are therefore cumulative.

The above generalizations sound more alarming on paper than they really are in fact. Actually the motorship has not altered trade routes so much as it has refined them. The economies of the Diesel engine make for faster, cleaner freight transport. while the truly flexible character of the oil fuel makes it possible to bunker more frequently, if necessary, with minimum trouble in minimum time. This is not in general necessary, however, because the motorship consumes far less fuel per day and per voyage than the steamer, and hence can, if necessary, be permitted to carry less fuel per day and per voyage than the steamer.

Owing to the flexibility of oil as a fuel and the comparative ease with which it can be transported in bulk, there are many more oiling stations in the world than there were ever coaling stations, and this makes it possible for a motorship to pick its place for bunkering at the cheapest port.

We have said that the motorship has

* No. 6 of our special series of articles, giving a concise summary of the present situation of the motorship in relation to sea transportation. This survey is based upon a paper read by A. C. Hardy, B.Sc., Editor of MOTORSHIP, before the Institute of Marine Engineers, London.



Motorship economy has welded two routes from New York to India into one. The link the motorship has made possible is shown by dotted lines

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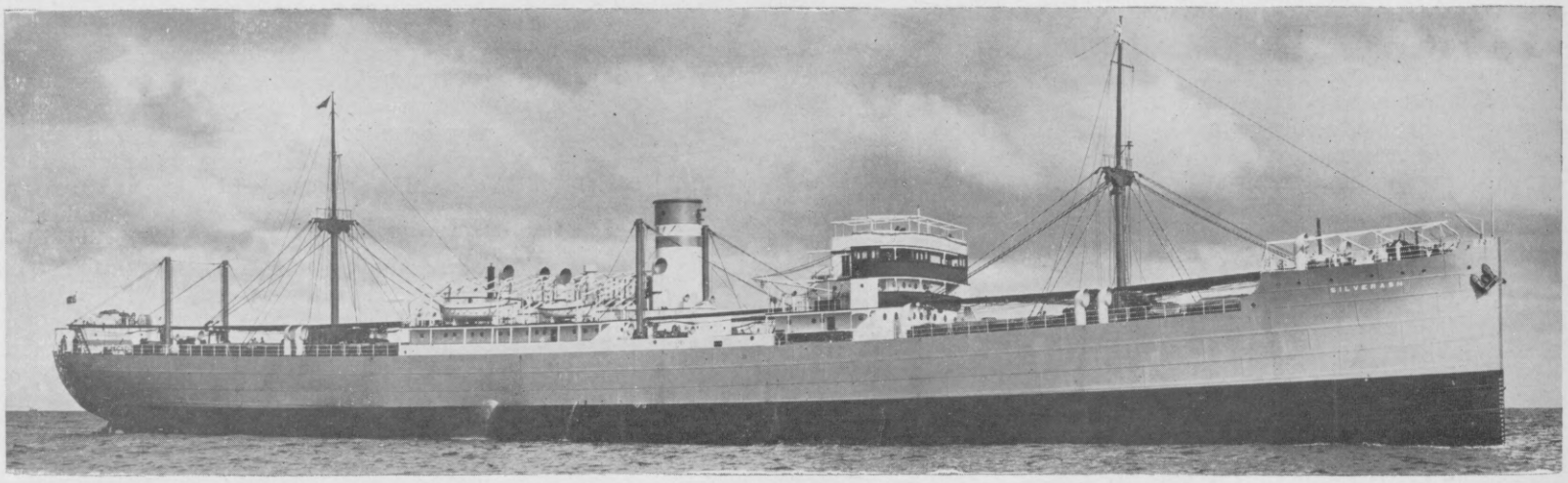
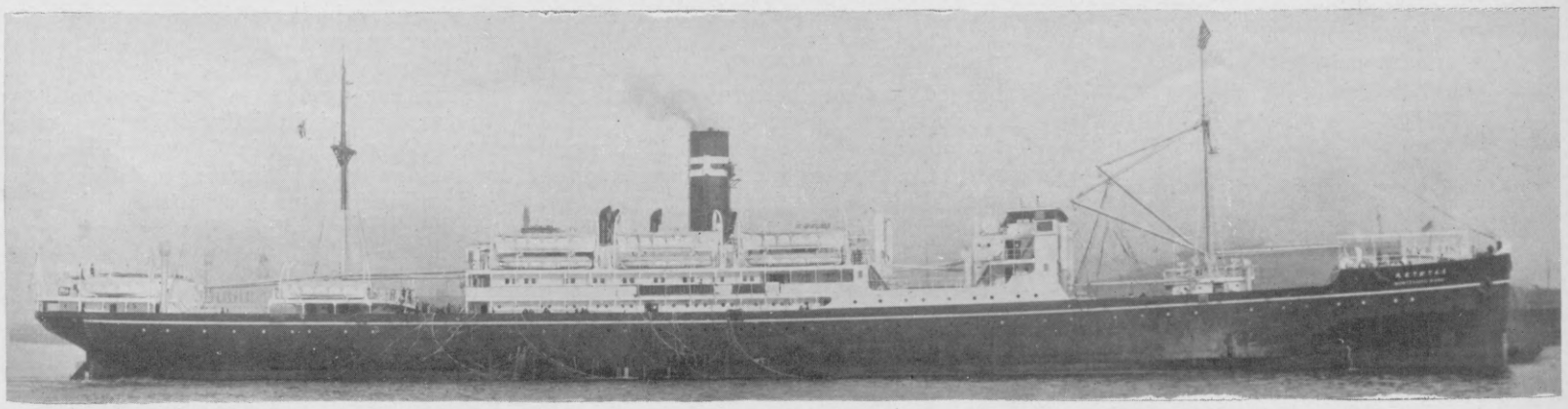
Fast, Modern Motorships in Round-the-World Service

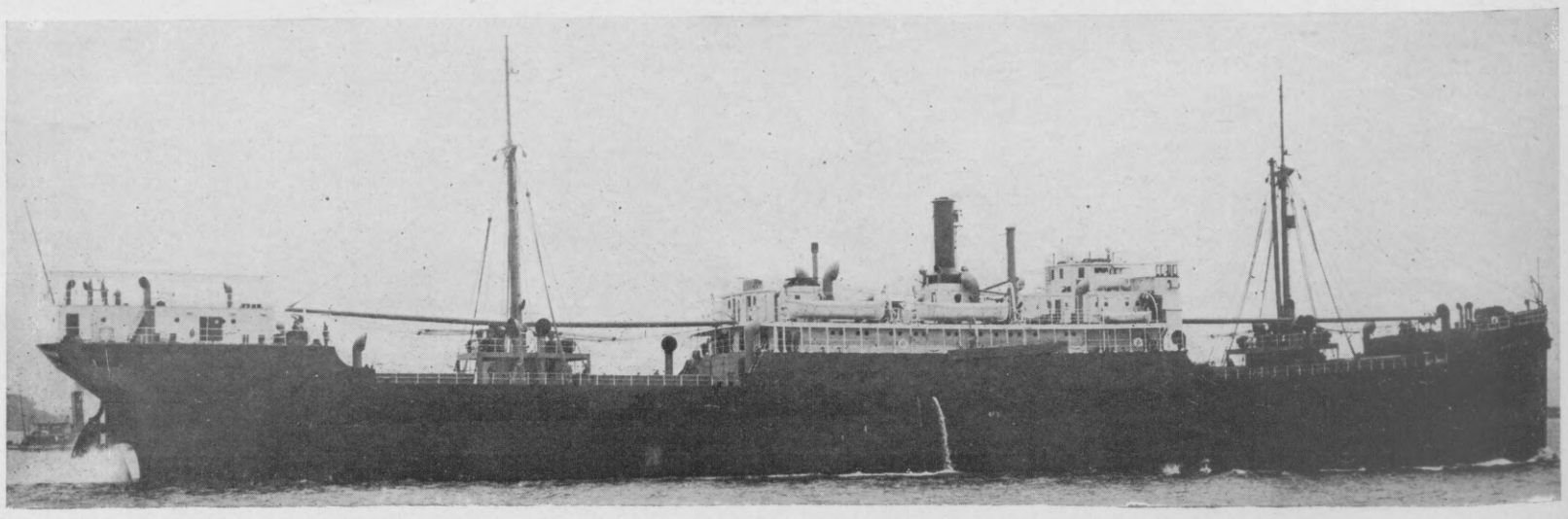
Ms. Asiatic Prince, operated in Furness Withy's New York-Far East Service, outward via Panama and home via Suez, has 10,000 *tons dw.,* 7,000 *hp. with twin screws and about* 14 *knots sea speed*



Ms. Silverash, operated in Kerr Lines New York-Far East service, outward via Panama and home via Suez, has 9,000 *tons dw.,* 5,500 *hp. with single screw and about* 14 *knots sea speed*



Ms. Montevideo Maru, operated in Osaka Shosen Kaisha lines Japan S.-N. American service, outward via the Cape and home via Panama has large passenger capacity, 4,600 *hp. with twin screws and about* 14 *knots sea speed*



Ms. West Honaker, operated in Roosevelt Lines New York-Australia-India service, outward via Panama and home via Suez has 8,000 *tons dw.,* 2,700 *hp. with single screw and* 12 *knots sea speed*

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"refined" trade routes. Nowhere is this more patent than in the Round-the-World services from New York to the Far East, outward by Panama and homeward by Suez. The old steamer route to the Far East from ports of the North Atlantic Range, naturally lay by way of Gibraltar, the Mediterranean and Suez. For the steamers now remaining in the trade, and especially the coal burners this is still largely the case.

But the motorship way is via Panama, which not only brings New York some 3,000 miles nearer to Yokohama, 1,600 miles nearer to Shanghai, and 400 miles nearer to Hong Kong than the Suez route, but also gives ships the advantage of practically the best bunkering rates and facilities in the world at San Pedro. Singapore and Colombo are actually about 2,300 and 5,500 miles nearer New York via Suez than via Panama, but motorships which have discharged cargo at Yokohama, Shanghai, and Manila, and which are picking up at Dutch East Indies ports or calling at Singapore naturally find it convenient to continue on via Suez taking advantage of good bunkering facilities at canal ports.

Panama Canal "Cuts the Corner"

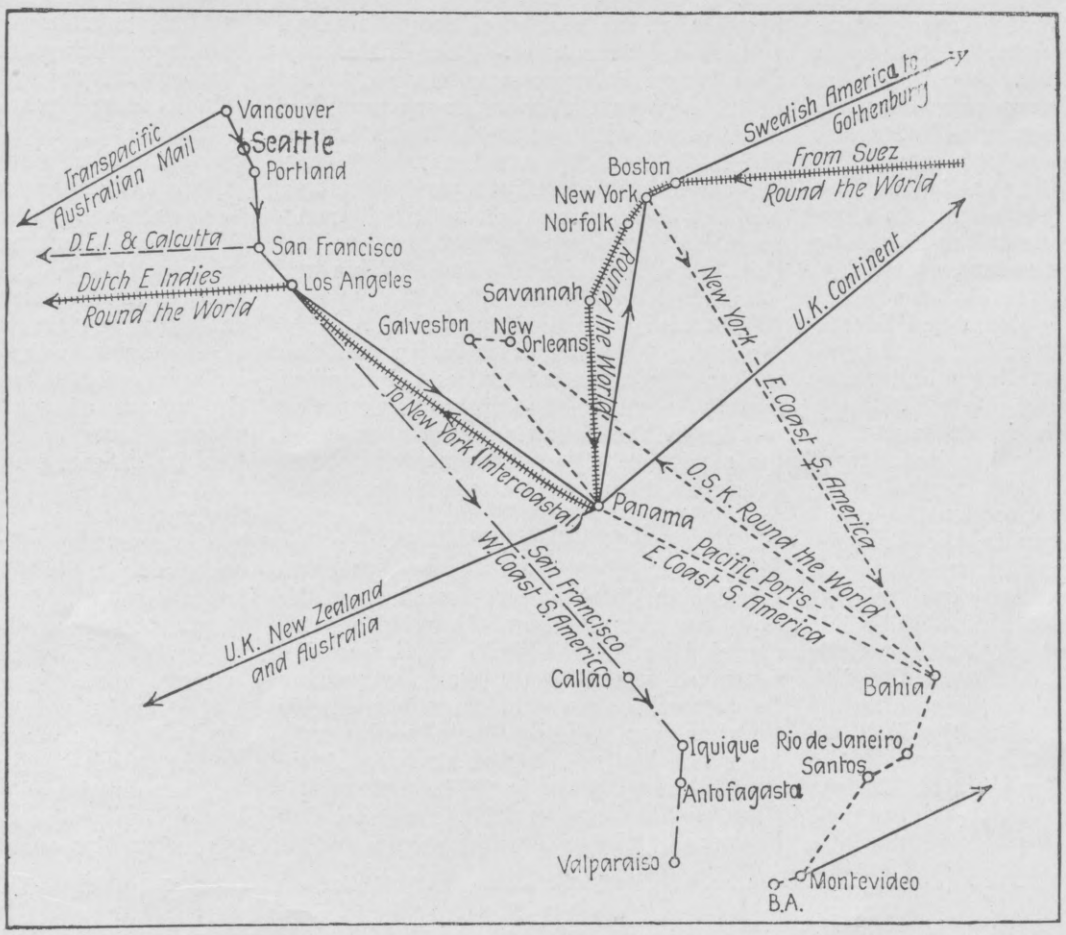
The route-clipping properties of Panama coupled with good Californian bunker oil have naturally attracted to the Caribbean ships engaged in the Australian trade, not only from North Atlantic Range ports but also from U.K. Continent ports. When the Commonwealth and Dominion Line placed its two first motorships in service on the London-New Zealand run, they routed them via Panama. Many of the steamers use the Suez route. Panama brings Wellington some 1,240 miles and Auckland some 1,220 miles nearer London than Suez, besides giving the ships the benefit of good bunkering en route.

Similarly the Roosevelt SS. Co., which operates the whole of the Shipping Board converted motorship fleet finds it convenient to route all these ships via Panama (they bunker at the Canal) to Australian wool ports, and then to send them on to Indian ports, returning home via Suez. There is thus no need for them to bother with expensive and inconvenient coaling at Newcastle, Australia.

It can in no sense be claimed that the Panama Canal was created for the motorship, but there is no question that its presence, together with excellent bunkering facilities at a convenient Californian exporting port has tended to create a number of routes upon which the expensive steamer is rapidly becoming extinct. The distance saved and the good bunkering facilities have helped considerably in this, and the natural result has been the appearance of fast, well-equipped motorships.

A Round the World Trade War

It is a somewhat curious fact that both the big "short cut" canals of the world—Panama and Suez—should have good fuel oil supplies near them. It is for this reason that with very few exceptions motorshipping is not active in using Cape Town, except as a terminal port. The Osaka Shosen Kaisha round-the-World route does so on account of the emigrant trade to Brazil and the motorships on this route eat up the 3,400 miles between Cape Town and Santos at the rate of some 340 miles per day. The two steamers they employ are delayed 3 days at Durban bunkering.



Importance of Panama Canal for motorshipping routes can be seen from this diagram

Round-the-World trade between New York and the Far East is of a valuable "general" nature outward, heavy goods being taken on at New York, and tobacco, cotton, etc., at Norfolk, Va., or Savannah, to Yokohama, Kobe, Shanghai, Hong Kong, Manila and a variety of ports in the Dutch East Indies. The Panama Canal opened up Los Angeles as a port of call and gave ships an opportunity of picking up Californian products at that port. Canned goods were exported at first, then the demand for speed grew and the steamer was too slow and heavy on fuel consumption to work out successfully against the newly introduced motorship. The latter, once introduced, produced intense competition. Competition invariably means increase of speed. With increase of speed it becomes possible to introduce refrigeration and hence Californian fresh fruit in addition to the canned variety could find a more efficient outlet to the Far Eastern markets. In order to illustrate how rivalry makes for better service, one may recall that one of the earliest motorship fleets in Round-the-World service was the Kerr Line of New York's fleet of six motorships built in British shipyards in 1924 and fitted with Doxford and Neptune Diesels of 2-cycle type. All these ships were well equipped freighters of sound, up-to-date design. Four Doxford ships had hulls of a special type to which much careful thought had been given with a view to obtaining good propulsive performance. The hull arrangement shows four holds, each with grain centre line divisions and a deep tank forward of the machinery space. One tier of 'tween decks was fitted. The two Swan Hunter vessels had an extra hold and were somewhat larger ships. The arrangement of holds and machinery was at that time of a distinctly progressive type, three holds and a deep tank being fitted forward of the machinery space and one hold abaft. Two tiers of 'tween decks were fitted. All electric deck auxiliaries took care of cargo handling. These were arranged in conventional steamship manner round the hatches. The sixth ship was similar to the two Swan Hunter ships.

Those Obsolescent Steamers

Such was the fleet which, in 1925, confronted a fleet of Furness Withy 11½ knot steamers. Obviously, something had to be done, and done quickly, and therefore in March, 1925, contracts were placed by this important concern with a German shipyard for five 10,000 deadweight motor-freighters with a stipulated sea speed of 14 knots, 3 knots in excess of the average sea speed of the Kerr lines. The stipulated delivery time was 10 months, and sailing from New York on March 25th, 1926, MALAYAN PRINCE, first of five new German-built motor cargo-liners reached Yokohama on schedule in the reasonable time of 35 days. Keeping well within her schedule, she returned to New York on July 20th, thus completing her maiden round-the-world trip in 119 days. The average speed for the whole distance worked out at slightly under 14 knots.

JAVANESE PRINCE, the second ship, left New York on April 20th, arriving at Yokohama two days ahead of her schedule and about seven days ahead of steamers employed on this service, until the advent of the new motorships. The remaining units of the new fleet left at regular intervals after this, and all are in service.

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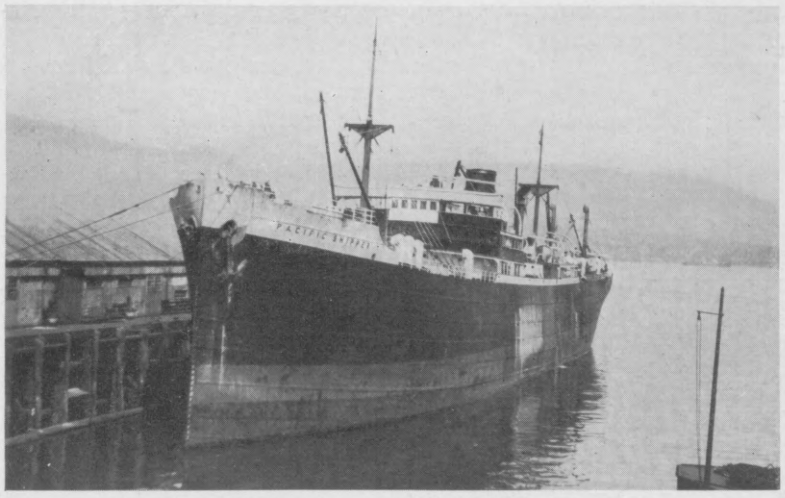
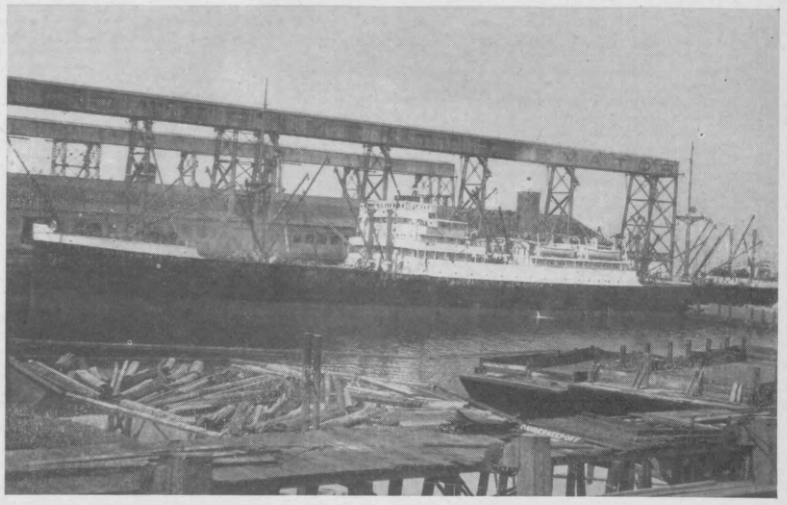


Furness Pacific motorliner loading for U. K. Ports



R. M. S. P. "Loch" motorship loading at Vancouver

Retrospective consideration, however, shows that the situation was an urgent one, but even the urgency of the case did not prevent Furness Withy from placing on ocean trade routes some of the finest motor freighters yet built. Also they were the first fast Diesel-driven cargo-carriers, and their speed of 14 knots has had a distinct effect upon the design of all cargo motorships built since. At one fell swoop the Furness Prince Line fleet offered to shippers from American ports to the Far East, in the first place, a service faster than anything else obtainable—thereby rendering obsolescent all tonnage, steam and Diesel, on Far Eastern routes—and in the second place, a service more reliable and more clean than any existing steam tonnage could give them. This is an important point for the U. S. Shipping Board and American shipowners to keep in mind when planning new ships or conversions.

The Kerr Line's reply to the Furness Withy fleet was not long in arriving and, with the maiden round-the-world sailing of MS. SILVERASH on October 25th, 1926, they began replacing their existing fleet of six 11-knot, 8,000 ton d.w. motor freighters by six 9,000 ton d.w. motorships of practically the same speed as the Furness vessels. The result of this competition is that, including the five Prince Liners, eleven of the fastest and best equipped motor freighters in the world are now operating on regular schedules to the Far East from New York.

A study of motorshipping trade routes shows that the results of competitive activities are cumulative. Kerr Lines' new fleet of six ships released their old fleet of six ships and, after one or two units had made occasional trips in the South American trade, created a new transpacific service extending to Calcutta and providing a direct, fast, economical, means of transportation for American products to the huge potential markets of India. This was established on March 11th, 1927, when a Kerr motorship sailed from Los Angeles direct for the Dutch East Indies, omitting calls at Japanese, China, and Philippine ports. Another motorship of the same line sailing in the following month extended the service to Calcutta, returning to San Francisco direct and not via Suez.

Direct Service to India

This direct service to India was the first the Pacific Coast had possessed since the Shipping Board's round-the-world service, operated by the old Pacific Mail, was discontinued several years ago. By routing its motorships straight from the Pacific Coast to Java, the new line offered a service which had not existed since the Java-Pacific line withdrew in 1923. This motorship service brings within range of San Francisco and Los Angeles a huge potential outlet for American goods. Calcutta is the largest city and chief port of India. It taps the Bengal district with its 140,000,000 population. The new schedule calls for 29 days from San Francisco to Macassar, 32 days to Soerabaya, 45 days to Singapore and 50 days to Calcutta.

The Kerr Line 11-knot fleet now omits calls at Kobe, Shanghai, Hongkong and Manila (which are taken care of by the 14 knotters) and sails direct for Macassar, Soerabaya, Samarang, Batavia, Belawandeli, Singapore, Penang and Port Swettenham, in the order named, in most cases extending the service to Calcutta. These 11-knot ships, in their turn, will undoubtedly be superseded by fast ships because of the nature of the cargoes carried. At present, however, their economies as motorships make them supreme on the routes.

We have dealt at some length with a particular aspect of motorshipping to show how competitive effort in the field is not only producing better ships, but is building up new routes. Motorshipping is tending slowly to change the geography of trade routes. The Pacific as a motorship operating ground is even more active than the Atlantic, and the motorship there is slowly tending to displace the steamer entirely. This is in all probability largely due to the abundance of cheap oil available in California which makes bunkering easy for motorships engaged in trade from Pa-

Main Round-the-World Motorship Itineraries

PRINCE LINE	KERR LINE	O. S. K. LINE	ROOSEVELT LINE	
New York	New York	——	New York	
Newport News	Norfolk	——	——	
——	Savannah	——	——	
Panama Canal	Panama Canal	——	Panama Canal	
Los Angeles	Los Angeles	Los Angeles	——	
Yokohama	Yokohama	Yokohama	——	
Kobe	Kobe	Kobe	——	
——	Darien	Yokkaichi	——	
——	Taku Bar	——	Sydney, N.S.W.	
Shanghai	Shanghai	Nagasaki	Melbourne	
Hong Kong	——	Hong Kong	Adelaide	
Manila	Manila	——	Freemantle	
——	Mascassar	——	——	
Samarang	Samarang	——	——	
Sourabaya	Sourabaya	Saigon	——	
Batavia	Batavia	——	——	
Singapore	Singapore	Singapore	——	
——	Medan	——	——	
Penang	——	——	——	
——	Colombo	Colombo	Colombo	Routes
Suez	Suez	Durban	Madras	
Gibralter	——	Capetown	Calcutta	
——	——	Santos	——	
——	——	Rio de Janeiro	Colombo	Alternative
——	——	Buenos Aires	Bombay	
——	——	Santos	Karachi	
——	——	New Orleans	Suez	
Boston	New York	Galveston	New York	
New York	——	Los Angeles	——	
——	——	Yokohama	——	
——				

Diesel and Fuel Oil Storage at Points on Round-the-World Trade Routes

PORT	CONTROLLING INTEREST	STORAGE CAPAC. BBL. 42 GALS.
Canal Zone		
(Balboa)	West India Oil Co.	65,000
	Asiatic Pet. Co.	135,000
	Union Oil Co. of Cal. ...	74,000
	Panama Canal Com.....	55,000
(Cristobal)	Asiatic Pet. Co.....	110,000
	Panama Canal Com.....	55,000
Hong Kong	Standard Oil Co. (N.Y.)	185,000
	Asiatic Pet. Co.....	200,000
Shanghai	Standard Oil Co. (N.Y.)	192,000
	Asiatic Pet. Co.....	150,000
Singapore	Asiatic Pet. Co.....	175,000
Suez	Asiatic Pet. Co.....	150,000
San Pedro	Standard Oil Co. (Cal.)	250,000
	Union Oil Co. of Cal. ...	?
	Shell Co. of Calif.....	200,000

This table shows, for the trade routes mentioned, only those installations for which Diesel and boiler oil are stocked.

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cific Coast, either to U. K.—Continent ports, or to the Dutch East Indies and the Far East, or to both coasts of South America. It also applies, as we have seen, to big motorships engaged in round-the-world services from New York. San Pedro is one of the cheapest Diesel bunkering ports in the world, and here ships fill their tanks proceeding from that port to the Far East, Philippines, China, Singapore, Japan, Java, and then onward through the Suez Canal to Boston and New York, where they discharge and load. Comparatively cheap and good Diesel oil is also obtainable at many points on his route including the Dutch East Indies.

Panama Canal transit has given an immense fillip to export of Pacific Coast produce, ranging all the way from lumber and canned fish at Puget Sound ports to fresh fruit at Californian ports. While, at the present time, we cannot claim that the motorship has the monopoly of this trade, it is a significant fact that large companies like Furness Withy, the Holland America Line, the Johnson Line, Cosmos Line, and an increasingly active number of Italian lines are now operating fast motorship between U. K.-Continent and Mediterranean ports and North Pacific ports. Such ships are having refrigerated holds fitted, which tends to increase their speed and to produce a finer type of ship. There is an increasing passenger trade, too, on these routes, and whereas two or three years ago passengers were carried merely as space fillers, modern cargo motorships are showing a tendency to develop into fast, comfortable intermediate liners.

For example, the Italian motorship FELTRE, which made her maiden voyage between the Mediterranean and North Pacific ports in May, 1927, is equipped to carry 36 passengers, and has an attractive smoking-room and social hall. She has a cargo capacity of 10,500 tons d.w. and is equipped to handle 350 tons under refrigeration. The power plant of the vessel consists of a six-cylinder four-cycle Diesel of 3,200 I. H. P. During builder's trials the FELTRE attained a maximum speed of 14.20 knots and an average speed of 12.82 knots. Steps are now being taken by the Navigazione Libera Triestina to provide for the increased demand for passenger accommodation. Furness Withy have constructed a fleet of 10,000 ton 13-knot refrigerated ships, with limited passenger accommodation, for service between U.K.-Continent ports and the Pacific Coast.

Here, then, we see the motorship as a medium which is definitely building up routes and services. Furthermore, the motorship is, owing to superior speed, taking the business from steamers on some routes. On others, motorship is competing with motorship. Speed has brought in its wake the intermediate ship, and this is particularly well illustrated in the case of the Osaka Shosen Kaisha's Round-the-World service, which is maintained by three big 14-knot motorships, with accommodation for 930 passengers, including 688 emigrants, and two slow steamers soon to be replaced by motorships. The service is unlike most Round-the-World services in that it neither commences nor terminates in New York, nor does it use the Suez Canal or the Mediterranean.

Commenced in 1916 in order to establish a direct communication between Japan and South America via South African ports, carrying merchandise and passengers from Japanese ports as well as from the ports of call, the service orginally was maintained by steamers. The motorships which have superseded them are fine shelter deck ships with a deadweight capacity of 6,800 tons.

Malayan Prince Maiden Voyage Schedule in Furness Withy Co's. Round-the-World Service

NEW YORK TO NEW YORK OUTWARD VIA PANAMA; HOMEWARD VIA SUEZ

Port.	*Date.*	*Days from N.Y.*	*Port.*	*Date.*	*Days from N.Y.*
New York A	March 15	—	Manila S	May 18	—
New York S	March 25	—	Iloilo A	May 19	55
Hampton Roads A	March 26	1	Iloilo S	May 21	—
Hampton Roads S	March 27	—	Cebu A	May 22	58
Colon A	April 2	8	Cebu S	May 23	—
Panama S	April 2	—	Sourabaya A	May 27	63
Los Angeles A	April 11	17	Sourabaya S	May 28	—
Los Angeles S	April 12	—	Samarang A. & S.	May 29	65
Yokohama A	April 29	35	Batavia A	May 30	66
Yokohama S	May 1	—	Batavia S	June 2	—
Kobe A	May 3	39	Singapore A. & S.	June 11	77
Kobe S	May 4	—	Penang A	June 15	82
Shanghai A	May 7	43	Penang S	June 16	—
Shanghai S	May 10	—	Suez A. & S.	July 1	98
Hong Kong A	May 13	49	Port Said A. & S.	July 2	99
Hong Kong S	May 13	—	Boston A	July 17	115
Manila A	May 15	51	New York A	July 20	119

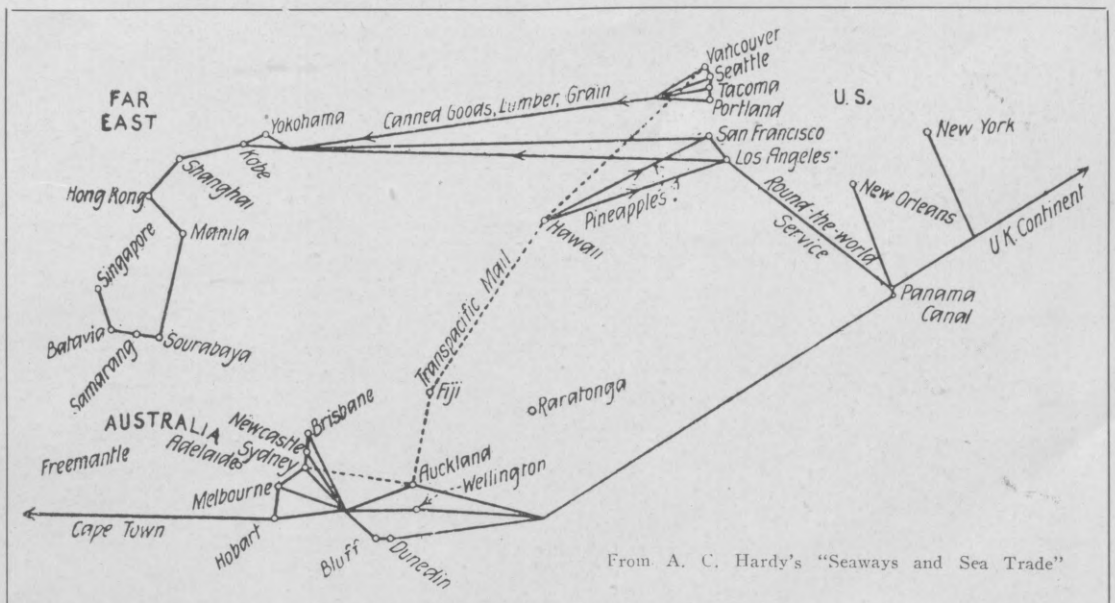
Japanese Motorshipping Activity

Starting from Kobe they run to Yokkaichi, then to Yokohama, then back again to Kobe, after which the Far Eastern ports of call are Nagasaki, Hongkong, Saigon, Singapore and Colombo. From Colombo the vessels make a long run across the Indian Ocean to Durban, which distance is covered in about 12 days. The three motorships on the service stay exactly one day in Durban, but the steamers, presumably for bunkering purposes, are compelled to stay for 3 days. Cape Town is the next port of call, and after leaving here the ships run a South Atlantic "leg" to Santos, Brazil, which is reached 19 days after leaving the Cape. Santos and Rio de Janeiro and Buenos Aires are all touched at for cargo discharge purposes and the latter port is officially the terminal of the outward portion of the voyage. The vessels stay here loading and unloading for about 10 days and then proceed to Santos and Rio de Janeiro for coffe cargoes, which they run straight up to New Orleans. American cargo is loaded at New Orleans, Galveston and Los Angeles, which is the last port of call before Yokohama. These motorships by their superior speed and efficiency can deliver coffee at New Orleans in record time and have made serious inroads on the steamer business in this trade.

Seventeen days are taken to cross the Pacific to Yokohama and from this port the vessels proceed on to Kobe, thus completing the round trip as the map shows.

The motorships on this route, Ms. MONTEVIDEO MARU and two sisters, can make, if necessary, between 15 and 16 knots with about 4,600 b.h.p., and for that reason they rank among the fastest motorships in commission. They run at 14 knots between the Cape and Santos because their passenger list is then at peak, and at the same speed between Santos and New Orleans on account of the coffee trade. This "leg" of the voyage they finish in 16 days, nearly 6 days less than steamers on the same route.

The Brazilian coffee trade and indeed the South American trade generally is now the scene of great motorshipping activity. The coffee trade has been compared with the old China tea trade by reason of the rivalry taking place. The Wilhelmsen line of Tonsberg maintains a Kerr Line service between New York and South America. Furness Withy have countered this by



Straight line route diagram of Pacific with N. American, Australasian and Orient connections

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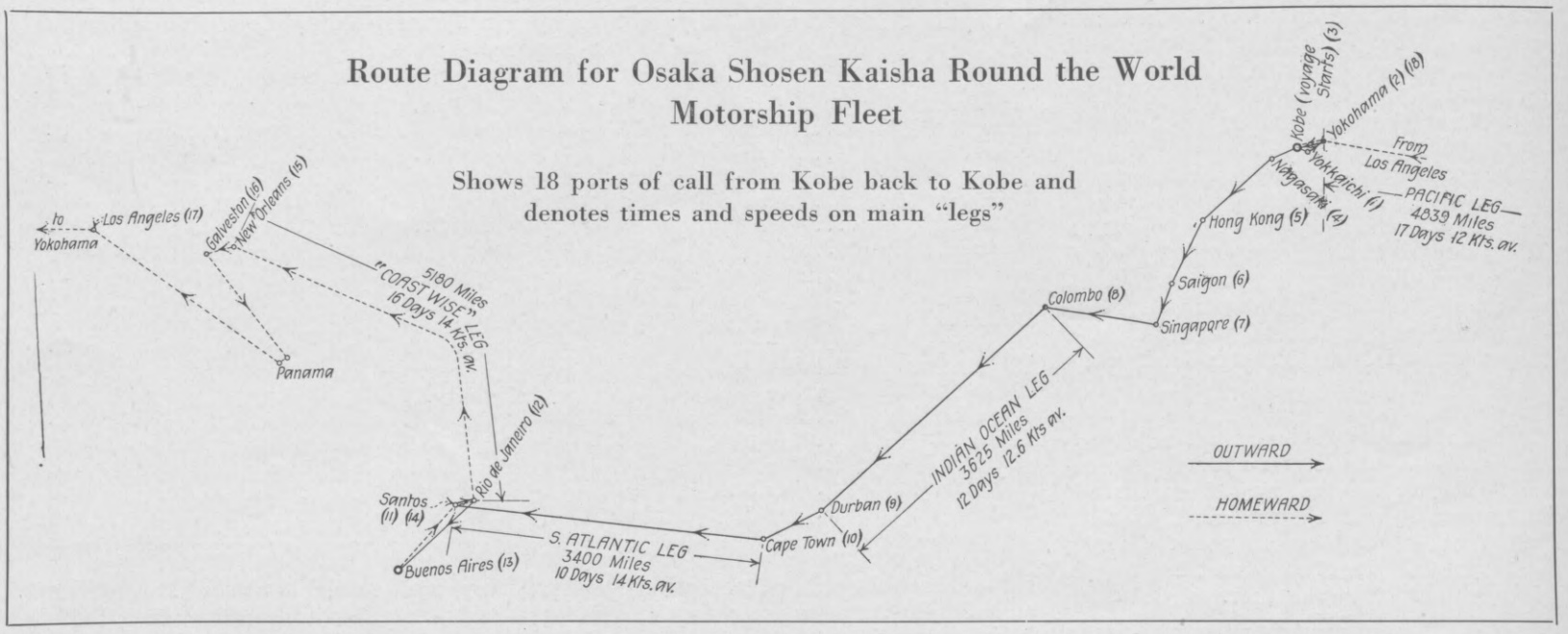

Route Diagram for Osaka Shosen Kaisha Round the World Motorship Fleet
Shows 18 ports of call from Kobe back to Kobe and denotes times and speeds on main "legs"
Kobe (voyage Starts) (3)
Yokohama (2) (18)
From Los Angeles
Yokkaichi (1)
Nagasaki (4)
PACIFIC LEG 4839 Miles 17 Days 12 Kts. av.
Hong Kong (5)
Saigon (6)
Singapore (7)
Colombo (8)
INDIAN OCEAN LEG 3625 Miles 12 Days 12.6 Kts. av.
Durban (9)
Cape Town (10)
S. ATLANTIC LEG 3400 Miles 10 Days 14 Kts. av.
Buenos Aires (13)
Santos (11) (14)
Rio de Janeiro (12)
"COAST WISE" LEG 5180 Miles 16 Days 14 Kts. av.
Panama
Galveston (16)
New Orleans (15)
to Yokohama
Los Angeles (17)
OUTWARD
HOMEWARD

bringing over from Liverpool-Danube service the motorships TRAMORE and SYCAMORE, now the BRAZILIAN PRINCE and CASTILIAN PRINCE. Speed is paramount in this trade just as it is in round-the-world trade, and the constant demand is for more speed and for new tonnage.

The U. S. Shipping Board, however, operates the major part of its converted motorship fleet through the Roosevelt Lines, New York, who are running the ships on a round-the-world schedule via Australia and India at an average speed of 11 knots.

These ships are rebuilt steam tonnage, thoroughly modernized and equipped with excellent passenger quarters. They run from New York to Sydney, N.S.W., Melbourne, Adelaide and Freemantle, via the Panama Canal, afterwards proceeding, as the route chart indicates, to Colombo, thence Calcutta and Bombay, or Bombay and Karachi via way ports after which they return to New York via Suez and the Mediterreanean.

This service has been made possible entirely owing to the economy of the Diesel machinery in the vessels and the fact that they only require to bunker once during the complete voyage—New York to New York—at Panama. It is a composite one and represents the linking of two services, the New York-India Service via Suez and the New York-Australia wool service via Panama with the abolition of the steamers formerly used on these routes. In the slack season for wool, it is economical, if possible, to send the ships on to Indian ports to load homeward cargo rather than send them back comparatively empty via Panama, but only a motorship can do this with real economy. Furthermore the "intermediate" nature of the ships with their passenger accommodation makes it possible to develop a passenger service to balance up the portions of the voyage when cargo is lacking.

When the wool season is in full swing, a separate service is employed to bring back a wool cargo straight to New York without proceeding on to Indian ports.

The Present and the Future

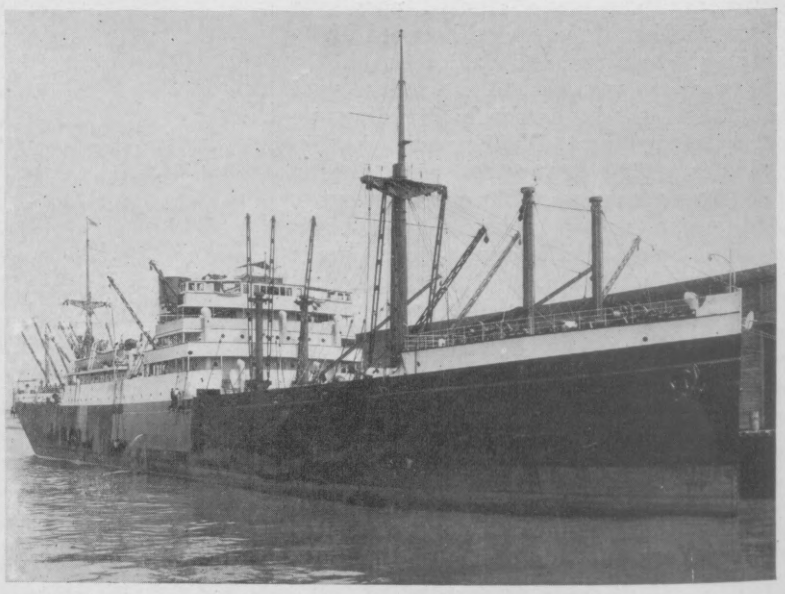
The 11 knot speed does not meet modern requirements in every respect, but up to the present it has been found to fulfil existing requirements because there is no other active motorship competition on the New York-Australia run nor on the India-New York run. The route, moreover, does not conflict with that of any of the 14 knot round-the-world routes, and the Kerr Line's San Francisco-India service is also an 11 knot one as well as their Seattle route.

Notice that these ships are slow speed for passenger-cargo work. The usual reason for fitting passenger quarters to a freight ship is because it has speed and because it has, in many cases, refrigerating machinery. Here are 11 knot freighters on which passenger quarters—of a type superior to that found on many large passenger liners—have deliberately been fitted in the course of conversion.

It is incorrect, however, to state that the speed of all motor freight ships, for successful operation, is 14 knots. The examples we have been quoting above would appear to indicate that the fast motorship is the thing of the future. Where valuable general cargoes are concerned, when refrigerated cargoes are carried, or when "market" commodities such as coffee, or even grain are being transported, 14 knots is an advisable speed. It does not seem probable that a 16 knot speed will become general on all routes for several years. Much has been written about the 16 knot motor-cargo ship, but when we remember the ratio in which power increases with speed†, it will be seen that a very big en-

†The 11 knot Kerr Liners have 2,200 s.h.p., the 14 knotters have 5,000 s.h.p. with only 1,000 tons more d.w. Two proposed Round-the-World Motorships for the Isthmaian Lines are to have 8,000 b.h.p. with 15 knots.

Furness Pacific motorliner unloading lumber in Surrey Docks London



Holland Amerika motorliner loading for Rotterdam in San Francisco

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Alternative Motorship Routes from London

	Miles Via Panama	Via Suez	Via Cape
Wellington N.Z. ...	11271	12447	13739
Sydney, N.S.W. ...	12473	11542	12834
Yokohama	12498	11146	14403
Shanghai	13448	10426	13763
Singapore	.....	8241	11417
Colombo	.....	6698	10468

Note that for motorships operating from London to New Zealand ports, the Panama route is the shortest. For Far Eastern ports, the Suez route is shorter and the fast Alfred Holt motorships operate in this direction. Routes via the Cape are ruled out where possible both on account of distance and also on account of lack of cheap bunkering facilities.

Note that for motorships operating from London to New Zealand and Australian ports and to all Far Eastern ports up to Hong Kong, the Panama route is shorter. That is why all round-the-world motorships are routed outward via Panama and homeward via Suez. Magellan is practically unused as a motorship route except by one San Francisco-West-East Coast South American Route.

Alternative Routes from New York

	Miles Via Panama	Via Suez	Via Cape
Wellington, N. Z.	8522	14230	.....
Sydney, N.S.W...	9691	13320	.....
Yokohama	9677	13040	.....
Shanghai	10645	12360	.....
Hong Kong	11190	11610	.....
Singapore	12522	10170	.....
Colombo	14112	8610	.....

London to Pacific Coast Ports, Furness Withy Motorships*

	Miles Via Panama	Days	Av. Speed	
Panama Canal	4778	18	11.06	
Los Angeles..		31	....	(Speed on long ocean route)
San Francisco	8053	33	10.15	
Vancouver ..	8588	37	....	

* Existing (1926) Motorships—new ships are 13 knotters.

gine power would be required for a consistent 16 knot sea speed. Most of the so-called 14 knot freighters on round-the-world services maintain an average sea speed of just under 14 knots. Inevitably, if a 16 knot speed is considered necessary owing to competition, passengers will have to be attracted to the routes in question, and this in turn will mean a bigger and more complicated ship.

In all cases where bulk cargoes are considered, however, an 11 knot speed is ample, provided those cargoes are such that there is a constant demand and supply.

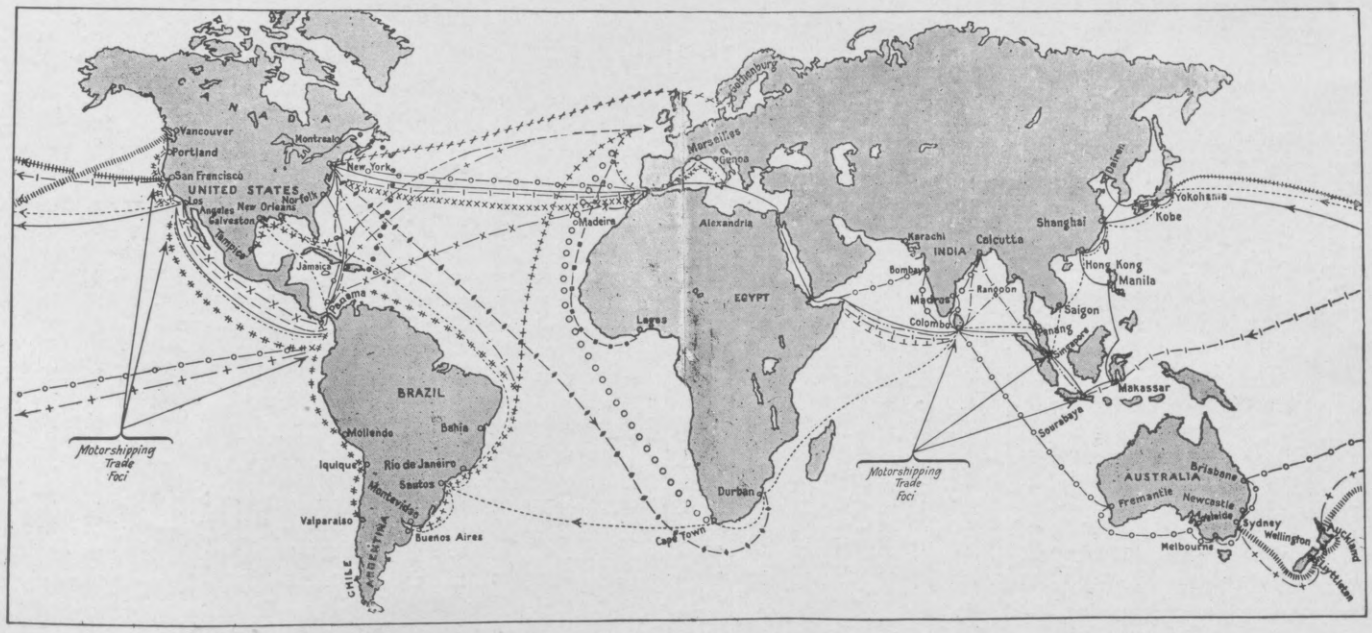
The more perishable the cargo, obviously, the greater the speed required. The shipper wants his goods quickly and the underwriter wants to carry his risk for the shortest possible time. This service the shipowner can offer with the motorship. Petrol or gasoline, crude petroleum, and in certain cases grain are merely transported in a stream, as it were, from source to demand and speed is not paramount. Even in such trades, however, the cheapness of operation of Diesel-engined ships enables new routes to be opened up. For example, the superior economy of the motorship over the steamer now permits molasses from Java or South Africa to be sold or delivered in the United States at prices approximating those of Cuban molasses. Cuba hitherto has been the principal source of sugar cane molasses used in U.S.A. The 10,900 dwt. motor-tanker ATHELCHIEF completed in 1925, brought the first cargo of African molasses, comprising 1,500,000 gal. from Durban and Port Natal to Wilmington, Del. This cargo was consigned to the astern Alcohol Corporation and was the second largest supply ever delivered at this plant.

The tendency of recent years in shipping has been for the segregation of tonnage into specialized groups. The motorship with its infinite variations of power for service is tending to accentuate this, and specialized motorships are being developed for special routes. The motor bulk-oil freighter with which we have scarcely dealt in this paper, has increased numerically during the last year. Particularly is this so in North American waterways where big motor tankers of 10,000 tons dwt., are operating coastwise.

The so-called motor tramp is one of two things. It either belongs to that big group of "elastic" tonnage with centre line grain divisions which congregates at the River Plate or St. Lawrence ports during the season for grain or at coal ports for outward cargoes in return for grain. The other role of the motor tramp is the long term charter to American shippers. A large percentage of Scandinavian owned and built motorships are spending their active lives in the North-South American trade and the many small companies registered in Scandinavia, owning perhaps two motorships, are generally formed for the sole purpose of chartering their ships to American companies. The Scandinavian motorship can be built and operated cheaply. She is invariably well built, less conservatively designed than many British ships, and very reliable. She is an important factor on world trade routes today.

The motorship has a stranglehold on the steamer on long ocean trade routes which it will be difficult for the latter to shake off. Shipowners of all nationalities are realizing its potentialities, the reliability and rapidity with which it delivers freight. Underwriters now realize that they need demand no special premium. In the foregoing we have shown something of routes on which the motorship is specially active .... the more optimistic among us like to think that it is only a question of time before the stranglehold becomes a death grip.

Route Map Showing World's Principal Long Haul Motorship Trade Lanes



Detailed Key of Reference for Routes

1—Pacific Coast—U. K. Continent Refrigerator Lines.
2—R. M. S. P. Southampton—S. America Mail Service.
3—Pacific Coast—E. & W. Coasts S. America Scandinavian "Tramp" Lines.
4—Furness and Kerr Lines Round the World Lines.
5—Union Castle Southampton—Cape Town Fast Mail Route.
6—Pacific Coast—Mediterranean Ports Fast Lines.
7—Alfred Holt & Co.'s Liverpool—Dutch E. Indies Lines.
8—Canadian Govt. Merchant Marine Fast St. Lawrence—W. Indies Banana & Passenger Line.
9—Commonwealth & Dominion and Shaw Savill Australia and N. Z. Lines.
10—Kerr Lines San Francisco—E. Indies & India Line.
11—Roosevelt Lines Round the World (Shipping Board) Service.

Detailed Key of Reference for Routes

12—Cosulich and N. G. I. Proposed Transatlantic Fast Mail.
13—Osaka Shosen Kaisha Round the World Service.
14—Bibby Lines Liverpool—Rangoon Service.
15—Furness, Wilhelmsen (Kerr), and Garcia & Diaz, N. Y.—S. America Lines.
16—Rotterdam Lloyd Rotterdam—Dutch E. Indies Line.
17—Union S. S. Co. of New Zealand's Transpacific Mail.
18—Ocean Line (Flensburg) Hamburg—Central America Line.
19—Elder Dempster Liverpool—Gold Coast Fast Mail.
20—Swedish America N. Y.—Gothenburg Mail Service.
21—Nippon Yusen Kaisha Transpacific Mail Service to San Francisco.
22—Atlantic Refining Co.'s Diesel-electric Gasoline service to S. Africa.

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U. S. SHIP CONVERSIONS COMPLETED OR IN HAND

	SHIP'S NAME	OWNER OF SHIP	WHERE BUILT	YEAR OF CONVERSION	CONVERTED BY	REGISTERED LENGTH	REGISTERED BREADTH	REGISTERED DEPTH	TONS GROSS	TONS D. W.	TYPE OF ENGINE	UNIT NO. OF CYLS.	UNIT CYL. DIAM.	STROKE	R.P.M.	NO. OF ENGINES	TOTAL S.H.P.
1.	MUNMOTOR	Munson S. S. Co.,	Great Lakes Eng. Works	1922	Sun S. B. & D. D. Co.	253.5	43.5	25.5	2,450	4,200	McIntosh & Seymour 4-cyc.	6	22.00	32.00	135	1	925
2.	ASHBEE	Kerr Lines, Inc., New York	Merrill Stevens S. B. Co.	1923	New York S. B. Co.	333.8	48.0	24.9	3,424	5,500	New York-Werkspoor 4-cyc.	6	27.00	47.00	110	1	1,500
3.	BIDWELL	Sun S. B. & D. D. Co., Chester, Pa.	Baltimore D. D. & S. B. Co.	1923	Sun S. B. & D. D. Co.	431.0	59.2	33.3	7,050	10,250	Sun-Doxford 2-cyc.	4	22.83	91.34	72	1	2,500
4.	FRANK LYNCH	W. J. Gray, Jr., San Francisco	Toledo S. B. Co.	1923	Union Construc. Co.	252.0	43.5	18.9	1,893	3,000	Pacific-Werkspoor 4-cyc.	6	20.47	35.43	135	2	1,500
5.	AURORA	Standard Transportation Co.	Baltimore D. D. & S. B. Co.	1923	Sun S. B. & D. D. Co.	431.0	59.2	33.3	7,050	10,250	Sun-Doxford 2-cyc.	4	22.83	91.34	72	1	2,500
6.	MUNCOVE	Munson S. S. Line, New York	Great Lakes Eng. Works	1923	Sun S. B. & D. D. Co.	253.4	43.7	24.5	2,450	4,125	McIntosh & Seymour 4-cyc.	6	22.00	32.00	135	1	925
7.	SEEKONK	Wm. Cramp & Sons S. B. & E. Co., Phila.	Ameri. International S. B. Co.	1923	Wm. Cramp & Sons S. B. & E. Co.	390.0	54.2	27.6	4,998	7,500	Cramp-B. & W. 4-cyc.	6	29.13	59.00	90	1	1,770
8.	CARISSO	Oceanic S. S. Co., San Francisco	Long Beach S. B. Co.	1924	Moore S. B. Co.	341.0	48.0	27.2	3,899	5,900	Pacific-Werkspoor 4-cyc.	6	20.47	35.43	135	2	1,500
9.	CHALLENGER	Sun S. B. & D. D. Co., Chester, Pa.	Bethlehem S. B. Co.	1924	Sun S. B. & D. D. Co.	410.0	56.0	38.0	7,590	11,850	Sun-Doxford 2-cyc.	4	22.83	91.34	72	1	2,500
10.	J. W. VAN DYKE	Atlantic Refining Co., Philadelphia	Pusey & Jones Co.	1925	Staten Island S. B. Co.	364.9	51.0	29.5	4,908	....	Ingersoll-Rand 4-cyc.	6	19.50	24.00	225	3	....[1]
11.	JACKSONVILLE	Kerr Lines, Inc., New York	Merrill Stevens S. B. Co.	1925	New York S. B. Co.	333.5	48.0	24.9	3,513[2]	5,500	New York-Werkspoor 4-cyc.	6	27.00	47.00	110	1	1,500
12.	LIO	General Petroleum Co., Los Angeles	Baltimore D. D. & S. B. Co.	1925	Bethlehem S. B. Corp.	431.0	59.2	31.4	7,245[2]	....	Bethlehem 2-cyc.	6	27.00	60.00	85	1	2,800
13.	WEST GRAMMA	U. S. Shipping Board	.....	1927	Bethlehem S. B. Corp.	402.0	54.0	33.7	....	....	McIntosh & Seymour 4-cyc. d. a.	4	32.00	52.00	95	1	2,700
14.	WILSCOX	U. S. Shipping Board	Oscar Daniels Co.	....	Bethlehem S. B. Corp.	402.0	54.0	33.7	5,984[2]	....	New London 2-cyc. d. a.	4	27.55	43.30	95	1	3,000
15.	SEMINOLE[6]	U. S. Shipping Board	Oscar Daniels Co.	1927	Todd S. B. Corp.	402.0	54.0	33.7	5,984[2]	....	Hamilton-M. A. N. 2-cyc. d. a.	4	27.55	43.30	95	1	3,050
16.	TAMPA[6]	U. S. Shipping Board	Oscar Daniels Co.	1923	Newport News	402.0	54.0	33.7	5,959	9,120	Worthington 2-cyc. d. a.	4	28.00	40.00	95	1	2,900
17.	UNICOI[6]	U. S. Shipping Board	Oscar Daniels Co.	1927	Newport News	402.0	54.0	33.7	5,959	9,120	Worthington 2-cyc. d. a.	4	28.00	40.00	95	1	2,900
18.	EAST INDIAN	Ford Motor Co.	Japan	1926	Sun S. B. & D. D. Co.	445.0	58.0	40.0	8,159	11,200	Sun-Doxford 2-cyc.	4	21.26	85.04	95	2	5,000
19.	SHARON	Atlantic Refining Co.	Pusey & Jones	1927	Alabama D. D. Co.	365.0	50.7	31.2	7,029[2]	7,000	Ingersoll-Rand 4-cyc.	6	19.50	24.00	225	3	2,550[3]
20.	BESSEMER	Atlantic Refining Co.	Pusey & Jones	1927	Alabama D. D. Co.	365.0	50.7	31.2	7,029[2]	7,000	Ingersoll-Rand 4-cyc.	6	19.50	24.00	225	3	2,550[3]
21.	POINT BREEZE	Atlantic Refining Co.	Pusey & Jones	1927	Atlantic Ref. Co.	365.0	50.7	31.2	7,029[2]	7,000	Ingersoll-Rand 4-cyc.	6	19.50	24.00	225	3	2,550[3]
22.	WEST HONAKER[6]	U. S. Shipping Board	Los Angeles, Cal.	1927	Bethlehem S. B. Corp.	410.0	54.0	29.7	5,428	8,006	McIntosh & Seymour 4-cyc.	6	32.00	60.00	95	1	2,700
23.	WEST CUSSETA[6]	U. S. Shipping Board	Los Angeles, Cal.	1927	Bethlehem S. B. Corp.	410.0	54.0	29.7	5,428	8,006	McIntosh & Seymour 4-cyc.	6	32.00	60.00	95	1	2,700
24.	CROWN CITY[6]	U. S. Shipping Board	Los Angeles, Cal.	1927	Bethlehem S. B. Corp.	410.0	54.0	29.7	5,428	8,006	McIntosh & Seymour 4-cyc.	6	32.00	60.00	95	1	2,700
25.	SANDMASTER	Construction Mat. Co.	.....	1926	Interlake Eng. Co.	251.0	43.5	20.0	....	....	Worthington 4-cyc.	6	....	....	200	2	1,200[4]
26.	GULF OF VENEZUELA	Gulf Refining Co.	Moore S. B. Co.	1926	Sun S. B. & D. D. Co.	425.0	57.0	33.0	6,661	10,000	Sun-Doxford 2-cyc.	4	22.83	91.34	72	1	2,500
27.	SAWOKLA[6]	U. S. Shipping Board	Oscar Daniels Co.	1927	Newport News	402.0	54.0	33.7	5,878	9,125	Busch-Sulzer 2-cyc.	6	30.00	52.00	90	1	3,000
28.	CITY OF RAYVILLE[6]	U. S. Shipping Board	Oscar Daniels Co.	1927	Newport News	402.0	54.0	33.7	5,878	9,125	Busch-Sulzer 2-cyc.	6	30.00	52.00	90	1	3,000
29.	CITY OF DALHART[6]	U. S. Shipping Board	Oscar Daniels Co.	1927	Newport News	402.0	54.0	33.7	5,878	9,125	Busch-Sulzer 2-cyc.	6	30.00	52.00	90	1	3,000
30.	YOMACHICHI[6]	U. S. Shipping Board	Oscar Daniels Co.	1927	Newport News	402.0	54.0	33.7	5,878	9,125	Busch-Sulzer 2-cyc.	6	30.00	52.00	90	1	3,000
31.	J. A. MOFFETT, JR.	Standard Oil Co. (N.J.) New York	Federal S. B. Co.	....	Todd S. B. & D. D. Co.	499.2	68.1	30.5	9,564	15,292	Hamilton-M. A. N. 2-cyc.	4	25.59	47.25	90	2	3,000
32.	E. T. BEDFORD	Standard Oil Co. (N.J.) New York	Federal S. B. Co.	1927	Federal S. B. Co.	499.2	68.1	30.5	9,564	15,319	Busch-Sulzer 2-cyc.	4	30.00	42.00	90	2	3,000
33.	HERMAN FALK	Oil Transport Co.	Baltimore S. B. & D. D. Co.	1927	Bethlehem S. B. Corp.	430.0	59.0	33.2	....	10,200	Falk 4-cyc.	8	18.00	22.50	275	2	2,650[5]
34.	CHESTNUT HILL	Anglo Chilean Nitrate Corp.	Pusey & Jones	....	Staten Island S. B. Co.	365.0	50.7	31.2	7,029	....	McIntosh & Seymour 4-cyc.	6	29.00	48.00	105	1	1,800
35.	COURAGEOUS	U. S. Shipping Board	Bethlehem S. B. Co.	....	Federal S. B. Co.	440.1	56.0	38.0	....	10,500	McIntosh & Seymour 4-cyc.	8	20.00	24.00	250	4	....
36.	DEFIANCE	U. S. Shipping Board	Bethlehem S. B. Co.	....	Norfolk Navy Yard	440.1	56.0	38.0	....	10,500	McIntosh & Seymour 4-cyc.	8	20.00	24.00	250	4	....
37.	TRIUMPH	U. S. Shipping Board	Bethlehem S. B. Co.	....	Boston Navy Yard	440.1	56.0	38.0	....	10,500	McIntosh & Seymour 4-cyc.	8	20.00	24.00	250	4	....

This table does not take into account 8 further Shipping Board ships for which engine contracts to Worthington, Busch-Sulzer, McIntosh & Seymour and Hooven Owens Rentschler have been let. The ships have not yet been allotted for the work.

[1]Diesel electric drive; total power of main engines is 2520 b.h.p. [2]Steamer measurement. [3]Diesel-electric drive 1800 hp. G. E. Motor. [4]Diesel-electric drive G. E. Motors. [5]Geared drive 90 r.p.m. for propeller. [6]Operated by Roosevelt SS Co.

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U. S. Steamer Conversions Reach Big Volume

Nearly Quarter Million Tons Gross Changed or Changing to Diesel Power Forming an Aggregate of 80,000 S.hp.

LLOYD'S Register ship construction returns, recently issued, do not show American shipbuilding conditions in a very favorable light. Indeed, the figures issued for the quarter ending September 31, compared with those for March 31, shows that America has dropped from sixth to seventh place among shipbuilding nations. . . This is an unpleasant, incontrovertible fact, realized to the full by all shipbuilding men who see in such facts no reflection upon their own capabilities, or energies, because they realize that they are cramped and tied by hard and fast economic laws. These laws make it impossible for them to put up to shipowners propositions for new construction which can stand a chance against the immensely lower prices of European shipbuilders. . . That is why Europe today has come to look to the American shipowners for a good sprinkling of orders. One particular British North East Coast yard has the whole of its ships occupied by tonnage for American shipowners including two fast passenger motorliners whose machinery has come from Switzerland.

Contracts have recently been placed with Scotch shipyards for four fine 16-knot motor cargo liners which will carry American goods from American ports—principally from New York—to Brazil and will bring America's coffee back in exchange for general outward cargoes. These ships will fly the British flag but will never touch a British port. They will be built, moreover, with the assistance of a monetary guarantee of the British Trades Facilities Act—in other words with government assistance. Government assistance is the only possible hope for American shipping and shipbuilding. The Shipping Board's Dieselization work has been the most constructive work yet done towards the establishment of an American mercantile marine.

Lloyd's Register of Shipping is never scrupulously fair to American shipbuilding . . . it does not in its returns take cognizance of the conversions which have taken place from steam to Diesel from time to time. Most of us seem to regard the Returns, moreover, in the same way that a Fundamentalist regards the Bible. But let us in future take due regard to the fact that we must add always to the American returns converted tonnage figures where those figures represent ships definitely broken out from laid up Shipping Board Fleets and modernized by the fitting of Diesel engines. There is perhaps a legitimate excuse for excluding from the Returns ships like the E. T. BEDFORD which formerly had been in operation as steamers, although the conversion work even on a ship like this means definite work for the shipyards. Conversion work on laid up Shipping Board tonnage, however, is of such a drastic nature as to put it definitely on a par with new construction. It is time that everyone thoroughly realized this. An examination of the proposed work for the new Diesel-electric conversions should leave no room for doubt on this score.

Approximately 59,590 gross tons of laid up Shipping Board tonnage has been reconstructed since the TAMPA went on service at the beginning of this year, involving well over 30,000 hp. of Diesel engine construction for just this one batch of work. A compilation of the total of vessels already converted and slated for conversion makes an interesting, imposing, and important piece of documentary reference. It indicates nearly a quarter of a million tons changed or changing to Diesel power, and an aggregate of practically 80,000 s.hp.

A compilation of the vessels already converted and of those designated for conversion demonstrates that the tonnage involved mounts to nearly a quarter of a million tons gross. It is a very striking total, and drives home in a very forceful manner the important influence of the Diesel engine on American shipyard work at the present day.

Of course, the aggregate tonnage must be viewed within its proper limitations. The table does not represent new tonnage, neither does it indicate merely work in hand, nor does it relate to the accomplishments of a single year. It combines the figures of several years, includes converted vessels in service as well as those which are under contract for conversion, and presents therefore a picture of steamer conversions in the United States as a separate and distinct activity.

Further Roosevelt Motorshipping Activity

ROOSEVELT Lines motorship activities are shortly to increase by their entry—with motorships—to the Far Eastern trade and the attention of Far East shippers has now been directed to the berthing at New York by Roosevelt Steamship Co. of the motorship WEST HONAKER scheduled to sail Nov. 12. The ship has accommodations for 14 passengers and was previously employed in the Austrailian run. Her ports will be Honolulu, Manila, Hongkong and Shanghai, whence, if cargo offers, she will proceed, on via Dutch East Indies Ports, Suez, and Gibraltar to North German ports—thence returning to New York. This inaugurates yet another round the world service made possible entirely by the economies of the motorship and further increased the motorshipping activities of the Roosevelt Lines. With the YOMACHICHI, fitted with a Busch-Sulzer Diesel recently by Newport News, and the motorship WM. PENN taken over recently from the Barber Lines, the Roosevelt Company operate 10 fine motorvessels, 9 of which have accommodations for 14 passengers each.

The latest conversion—Ms. SEMINOLE ran her sea trials this month from the Tietjen & Laing plant of Todd Sb. Corp., Hoboken, N. J. This vessel differs from the previous conversions in that no passenger quarters are fitted. She is powered by a 3,300 hp. Hooven Owens—M.A.N. Diesel.

Arico Grinding Compound

Arico is a compound designed for simultaneous grinding and polishing, heavy pressure being used for cutting and a lighter one for finish-polishing. It is especially recommended for use on valves, giving them a smooth and velvet finish on the seat. The seat is easily cleaned after the job has been carried out by means of water or gasoline. Arico is a water mixed compound and is sold through jobbers in ¼ lb. and 1 lb. tins, and also in small utility tubes like tooth paste. This is the first time it has ever been possible to use a tube for grinding compound, the tendency of most compounds being to dry out and get hard —whereas Arico holds its moisture and consistency to the last. It is manufactured and offered by the American Hammered Piston Ring Company of Baltimore.

From Motorship to Diesel Dredge

The motorship ORMIDALE, Ex-Lake Oneida, equipped with two 500 s.hp. McIntosh & Seymour Diesel engines has been purchased by the Seneca Sand & Gravel Company of Buffalo, who plan to convert her into a Diesel dredge. The vessel recently made a voyage to Buffalo from New York loaded with cargo. Because of the cargo contract it was necessary to do some reconditioning work on her before sailing.

New Russian Motorships

Two combination passenger cargo motorships have been ordered for the Crimea-Caucasian Line by the Russian State Steamship Company. The vessels will be built to Russian designs. Orders were also recently placed with Krupps of Kiel for the construction of four motorships for the Russian Merchant Marine.

Motorship's Fast Voyage

Furness, Withy & Co., Ltd., agents of the Prince Line, announced recently the arrival of the motorship CHINESE PRINCE at Shanghai on October 9, having made the voyage from New York via Yokohama and Kobe in 39 days.

Ford Motor Co. is considering converting a steamer for carrying rubber from Brazil to Diesel power.

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Fulton Acquires Interest in Foos

A Substantial Interest in the Foos Engine Company, Springfield, Builders of the Foos Diesel Engine, Has Been Obtained by the Fulton Iron Works

HENRY J. STEINBREDER, president of the Fulton Iron Works of St. Louis, has been elected chairman of the Board of Directors of the Foos Engine Company. George Foos, son of John Foos, founder of the business in 1887, has been appointed president. The controlling interest of the outstanding stock, however, will remain in the hands of Miss Margaret Baker, secretary and treasurer of the Foos Engine Co., who retains her position in the company.

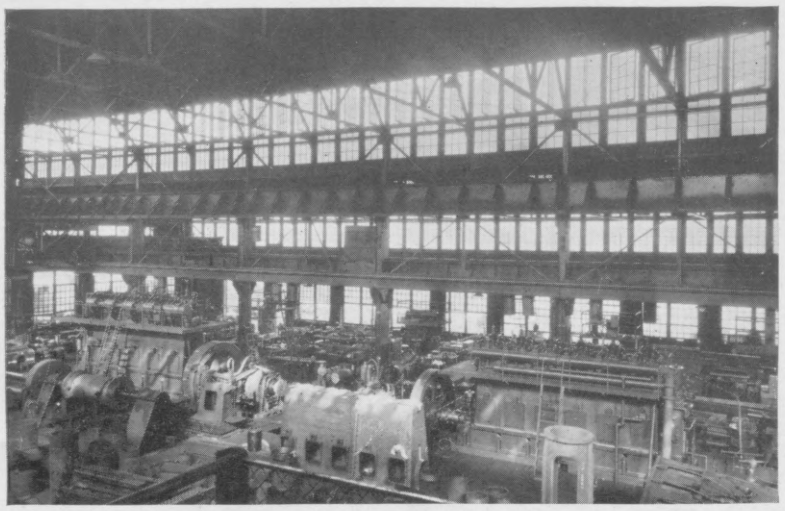
The new arrangement gives the two companies a range of marine and stationary Diesel engines from 10 hp. to 1500 hp., Foos manufacturing the smaller engines and Fulton the larger size engines.

The benefits of the grouping together of the two lines of engines, Mr. Steinbreder says, are evident. The arrangement will give both companies the advantage of combined sales and manufacturing organizations.

In emphasizing the necessity for the two plants to retain their individual identities, Mr. Steinbreder pointed out that it would be mutually advantageous to both lines to have the two plants retained, as each line calls for different types of plants in their manufacture.

The present plant of the Foos Co., he declared, is adequate for handling the line of 10 to 300 horsepower engines, while the St. Louis plant of the Fulton Iron Works is adequate to handle the 400 to 1,500 horsepower units.

That the arrangement should result in an increased volume of business for the local concern is the belief of Mr. Steinbreder and his associates in the combination. It is an important development in domestic Diesel engineering.



Fulton-Foos shops, as the above illustrations indicate, will be fully equipped to take care of all types of marine Diesel engineering

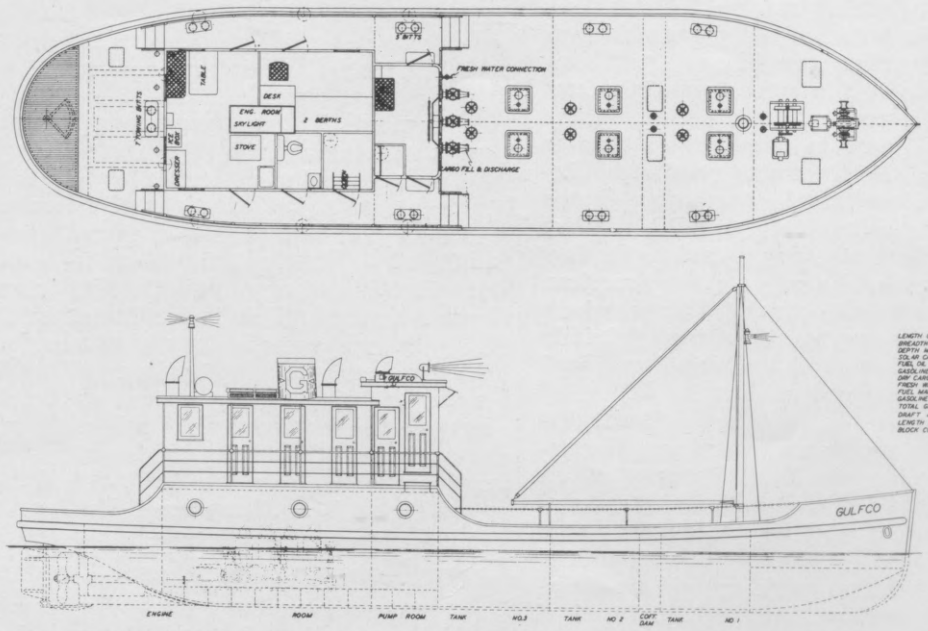
Small Motor Tanker for Florida

THE motor tanker GULFCO is a modern steel service boat being built by the Gulf Refining Company at Jacksonville, Fla., at the shipyards of the Gibbs Gas Engine Company for service on Biscayne Bay and adjacent territory. MS. GULFCO was designed by W. B. Lamb, General Superintendent of Construction, Gulf Refining Company, and is intended for bunkering service for vessels of all types handling crude and refined products.

MS. GULFCO is equipped with a 120 hp. Kahlenberg semi-Diesel engine. Her pumps and all auxiliaries are electrically driven. All discharge lines and other service equipment is of ample size for quick discharging under any and all conditions.

Winton Eastern Sales Activities

The Winton Engine Company, of Cleveland, Ohio, have established an Eastern Sales & Service office in charge of A. G. Griese, at No. 331 Madison Avenue, New York City. As a direct branch of the factory, this office will supervise the sales and service of Winton gasoline and Diesel engines as well as auxiliary equipment on the entire east coast. Mr. Griese is assisted by F. C. Erdman, T. L. Meckbach and H. V. Haymann.



The motor tanker Gulfco has 120 hp. and a cargo capacity of 6400 gal.

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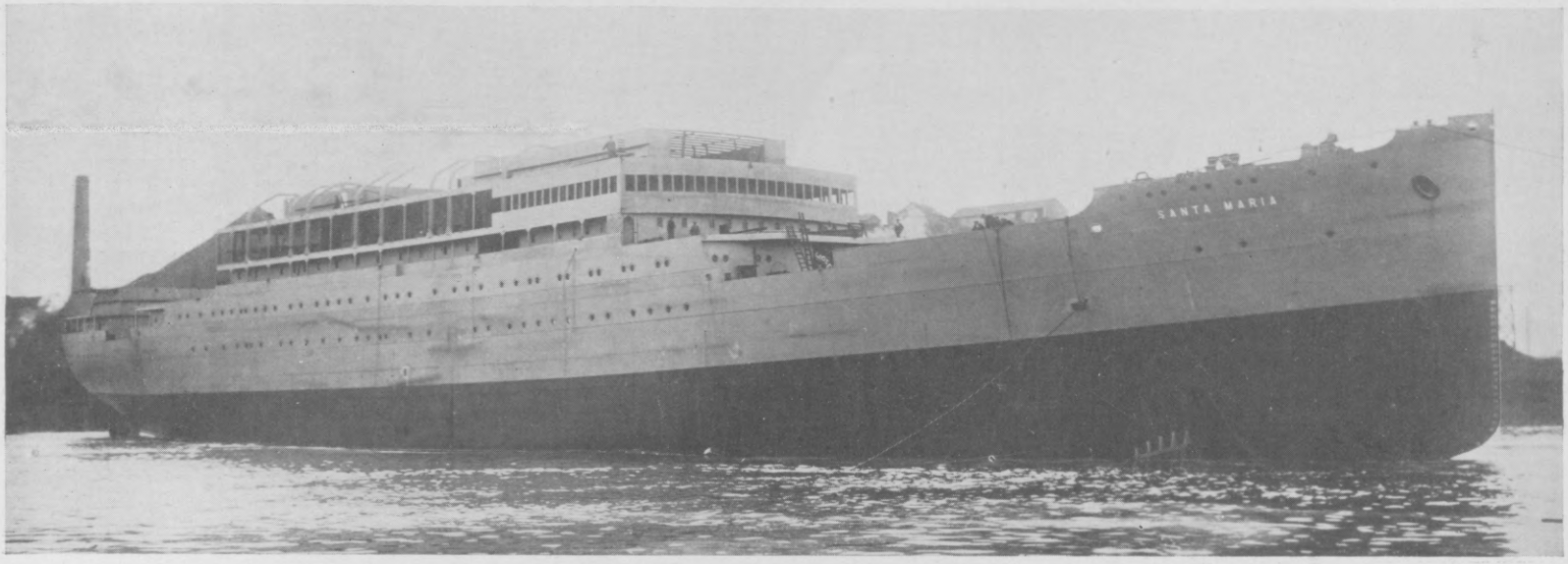

The Two New Grace S. American Motorliners

Ms. Santa Barbara and Santa Maria with 16½ Knots Will Be Two Fastest Ships in South American Trade

THE twin screw motor passenger liner SANTA MARIA which has been built by the Furness Shipbuilding Co., Ltd., Middlesboro, England, for Grace Lines, Ltd., New York, will mark a new era in transportation between New York and the west coast of S. America when she comes on service early next year.

The vessel is the first of two sister vessels specially designed and constructed to conform with the requirements of the owners regular passenger and freight service between New York via the Panama Canal to Peruvian and Chilian Ports on the West Coast of South America. Every modern comfort and convenience for luxurious travel under tropical conditions is being provided.

Only first class passengers are catered for and accommodation is provided on five decks for 157 persons in 28 single berths, 49 two-berth and four special suites-deluxe, 23 of the two berth cabins are further arranged with Pullman berths to accommodate children. A large proportions of the rooms have independent private bath and lavatory accommodation adjoining same.

The Promenade deck upon which are situated the Social Hall, Lounge, Smoke room and Verandah Cafe provides promenade facilities under all weather conditions and a glass screen with sliding windows is fitted at the forward end and for a considerable distance along each side. Additional promenade space for deck games is arranged on the Boat Deck which is entirely covered by a special sun deck.

The vessel has a cruiser stern, straight stem and is of the two-deck type with complete shelter deck with tonnage opening aft. Above the shelter deck are the bridge and forecastle decks which in turn are surmounted by promenade, boat and sun decks.

The hull and machinery are constructed under special survey to obtain the highest class at Lloyds, and to conform with the latest United States Steamboat Inspection Service Regulations.

The principal dimensions are length 486 ft. 6 in., beam 64 ft. 00 in., load draft 25 ft. 0 in., deadweight about 7,000 tons, and gross tonnage about 9,000 tons. The hull is sub-divided by nine complete watertight bulkheads and a deep tank with three compartments is fitted forward of the machinery space in addition to the sides of the auxiliary boiler room and four cellular double bottom tanks for the carriage of oil fuel. Special fresh water tanks are arranged in the double bottom and at the sides and between the shaft tunnels in accordance with the latest U. S. requirements.

Characteristics of New Grace Liners

Length b.p.	486 ft. 6 in.
Beam mld.	64 ft. 0 in.
Draft (load)	25 ft. 6 in.
Deadweight	7000 tons
Gross tonnage	9000 tons
Power	8000 b.hp.
Speed	16½ kts.

Eight insulated chambers are provided for the ship's provisions and six special insulated cargo chambers are arranged for carriage of fruit together with all the necessary fans, coolers, brine grids, meat hooks and three electrically driven co-refrigerating machines by J. & E. Hall of London.

The plumbing, sanitary and ventilation fittings are of the very highest class and the latest Thermotank Punkah Louvre system of ventilation is fitted throughout the accommodation to meet the varying range of climatic conditions experienced on service.

The culinary and laundry departments are all electrically operated with all the most modern equipment including electric cooking ranges, etc., both for passengers and crew.

Purser's bureau, barber shop, printing rooms and children's dining rooms are also special features. Ample baggage, mail bullion and store rooms are provided.

As rapid cargo handling, generally into lighters, is an essential service requirement, the facilities provided include twenty 5-ton and one 50-ton and one 25-ton tubular steel derricks arranged on two masts and six special steel samson posts.

Special thermostatic electric fire detectors together with a complete chemical fire extinguishing system is fitted throughout the vessel in compliance with the latest American regulations.

The deck machinery is all electrically operated including 17 winches of 3, 5 and 7 tons capacity and the windlass is also electrically operated. The steering gear is of 4-ram electro-hydraulic type operated both by telemotor and Sperry electric control. Sperry gyro-compass equipment and searchlights are also fitted and electric winches are provided for boat hoisting.

The main propelling machinery consists of twin sets of single-acting 2-stroke Diesel engines manufactured by Sulzer Bros., at their Winterthur Works and installed by the shipbuilders. The engines develop 8,000 b.hp. and are designed to enable the vessel to maintain a service speed of 16½ knots. Four 420 b.hp. auxiliary Diesel generators and two large boilers are provided for auxiliary purposes and the usual complement of auxiliaries is arranged in the engine room to deal with the various services. To determine the most economical form under service conditions models of both the ship and propellers were special subjected to a wide series of tests in the Wm. Froude Experimental Tank at the National Physical Laboratory, London.

New Tacoma Motor Tug

In the new tug for the Magnolia Tug & Barge Co. of Tacoma, Wash., a 250 s.hp. Fairbanks Morse Diesel engine is being installed. The tug has been named CAPT. O. G. OLSON.

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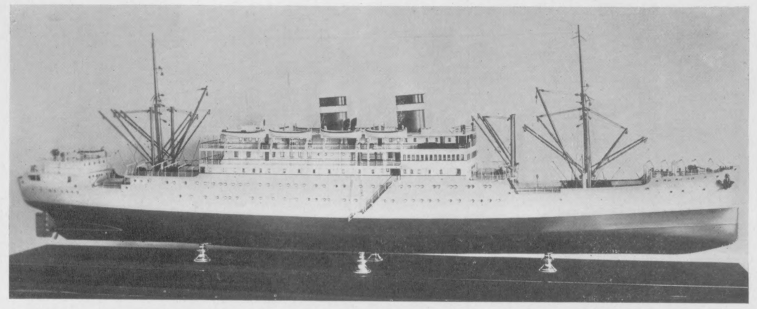
Grace Lines Two 9,000 Tons Gross Motor Passenger Liners

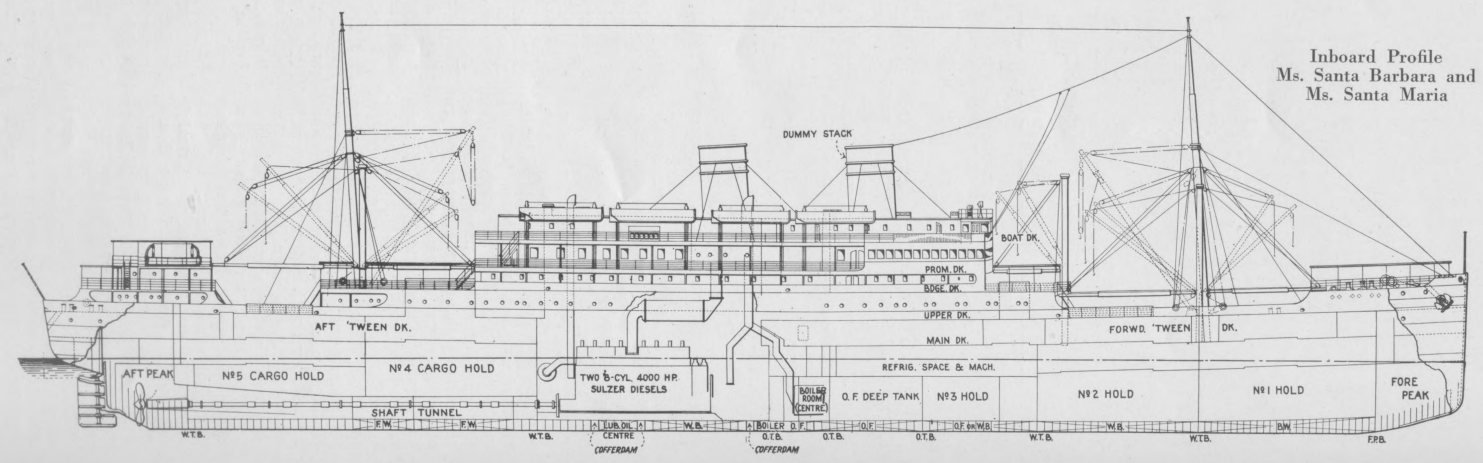
These Ships with 8,000 Sulzer hp. and 16½ Knots Will Be Two of the Fastest Ships in New York—S. American Trade Via Panama



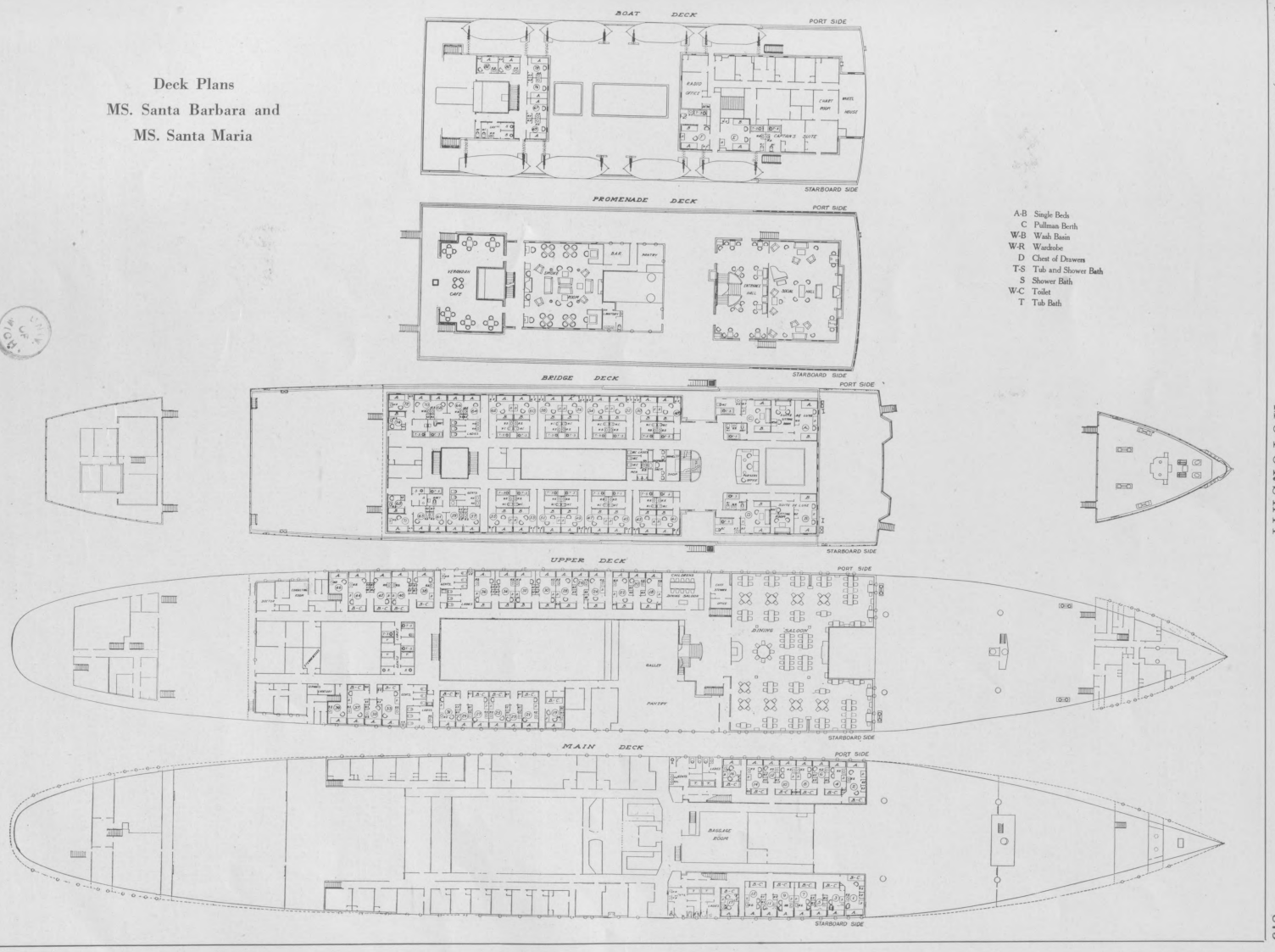
The sturdy powerful appearance of the Grace motorliners is well illustrated in the above scale model

Route map of the new Grace motorliners

Inboard Profile
Ms. Santa Barbara and
Ms. Santa Maria



Deck Plans
MS. Santa Barbara and
MS. Santa Maria



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A Small Diesel Coastwise Freighter

Ex-Trawler Converted to Motor Coastwise Freighter Operating with Great Economy from Boston to Port Newark and Norfolk, Va.

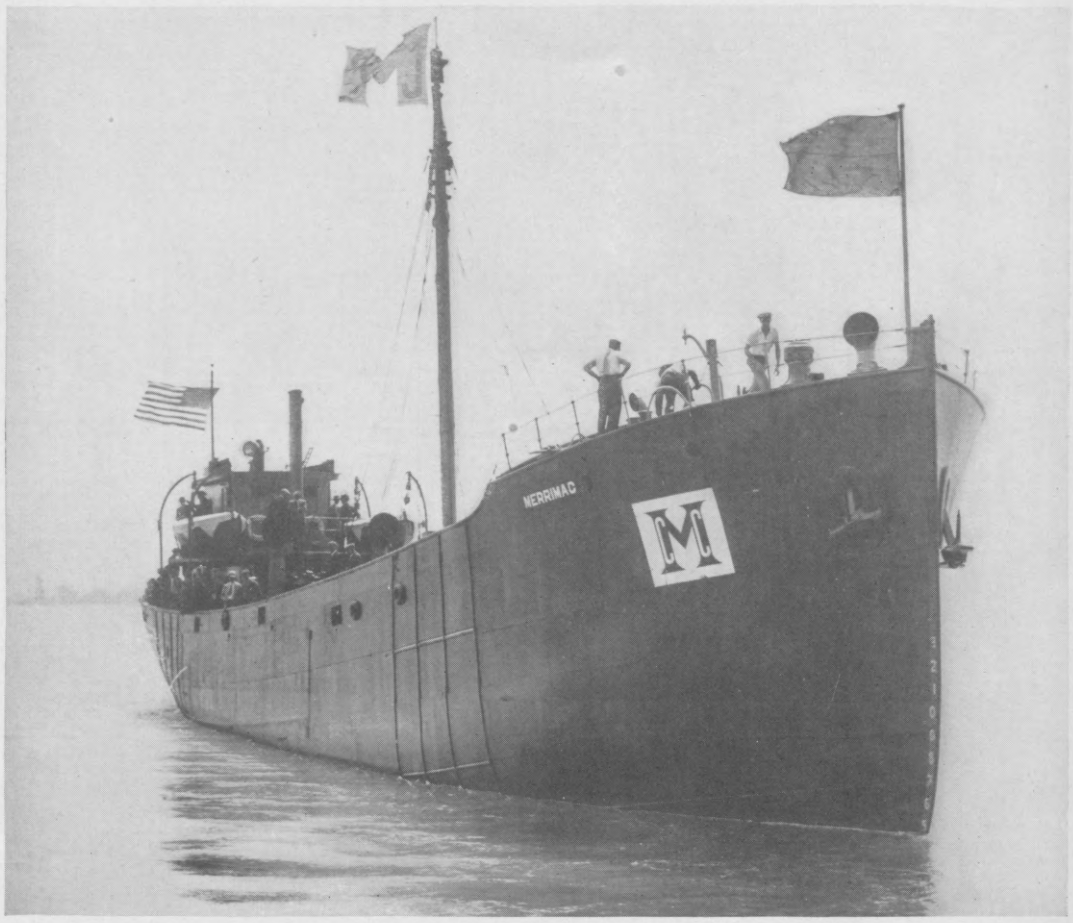
AN important small coastwise type motor freighter is the MERRIMAC, owned by the Merrimac Chemical Company of Boston, Mass. She is 144 ft. long, 22 ft. 8 in. beam with a draft of 13 ft. 3 in., gross tonnage 303 tons. She is used for carrying freight between Boston and Port Newark and Boston and Norfolk for the Merrimac Chemical Company in both directions, and is proving a very profitable proposition to her owners.

The propelling machinery consists of one 400 hp. 6-cylinder direct reversing Standard full Diesel engine which gives the ship a speed when loaded of 10½ knots. By actual test, this engine shows a fuel consumption of less than 0.45 per hp. hour and a lubrication economy equal to 3000 horse power hours for each gallon of oil.

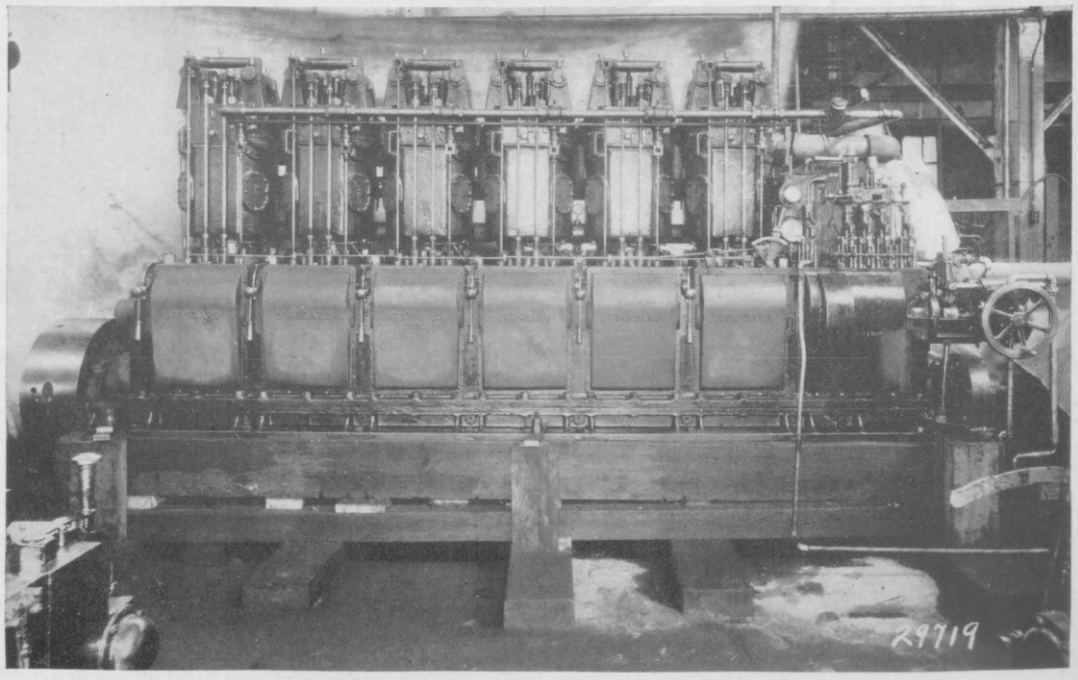
In the installation of the main engine and auxiliary the key note of simplicity is followed very carefully. All the piping has been laid out in a most efficient manner. The air tanks for storage of compressed air for handling the main engine are not only sufficient, but also furnish air for the air starting gear and the compressor on the main engine and are of sufficient capacity to more than maintain the full supply of air under the most exacting conditions. This was clearly demonstrated at the time of her trial, when the engine responded to more than 125 handlings within a very short space of time. The lubricating oil is cooled, cleaned and returned to the engine under a pressure to all parts.

In this engine, the Standard Motor Construction Company have made a great advance in the direct reversing control, having installed a new patented oil shifted valve shaft. This is controlled by a small lever which operates the pilot valve and makes starting, stopping and reversing of the engine as simple and as easy as the throwing of a small electrical switch. There is absolutely no vibration in the ship when operating and the ship is very quick to the response of her 80 in. diameter propeller wheel.

The MERRIMAC is a wonderfully sturdy little ship and has shown herself a very able and seaworthy boat in the coastwise run to Norfolk, making this trip on schedule time with the greatest economy and minimum of crew.



Coastwise motorship Merrimac has a loaded speed of 10½ knots



Merrimac's main engine is a 6-cylinder 400 hp. Standard unit

Record Trip on New York State Barge Canal

The Diesel-electric TWIN PORTS of the Detroit-New York Transit Company made what appears to be a record trip from Detroit to New York City. The vessel, loaded with 600 tons of merchandise for export, including a deck load of automobiles, left Detroit on Sept. 30, and arrived in New York City at 7 A. M. of October 5. The motorship entered the canal from Lake Ontario at Oswego on October 2 at 8 P. M.

Mr. George S. Hendrie of the Detroit-New York Transit Company expressed praise for the efficiency of the canal system. His letter stated in part as follows: "We received a telegram from New York this morning stating that the PORTS had arrived at 7:00 A. M. and we attribute the remarkably quick passage almost entirely to the quick dispatch through the canal."

The motorship is 258 feet long with a beam of 42 feet and is driven by a G. E. motor of 750 hp. which takes current from two Lombard Diesel engines. The canal capacity of this vessel is 2,000 tons although it has frequently carried more.

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Bay of Fundy Diesel Driven Ferry

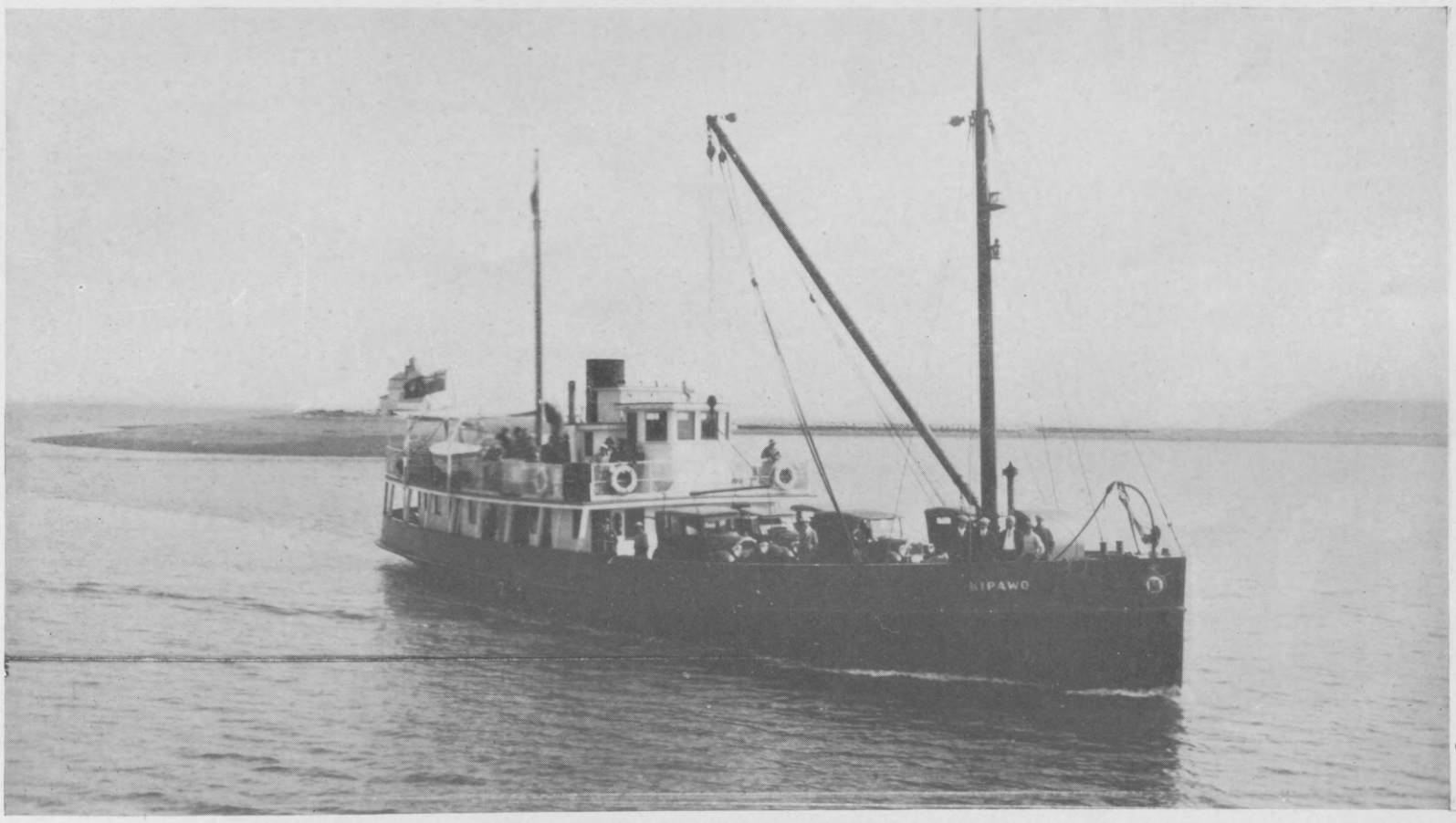
Fine Passenger and Automobile Carrying Vessel Developed to Cope with Strong Tides in Minas Basin

A STURDY type of ferry is exemplified in the Dominion Atlantic Railway's 200 tons gross motorvessel KIPAWO which maintains a daily service between Parrsboro, Kingsport and Wolfville, Nova Scotia. These ports are located on Minas Basin, a branch of the Bay of Fundy—a region noted for its exceptionally high tides and strong currents. The KIPAWO'S trips are governed by the tides, as it is impossible for her to reach the wharves at low water.

The advent of the automobile and the improved roads throughout Nova Scotia was responsible for the KIPAWO being placed in service to transport cars and passengers between the north and south shores of Minas Basin. Built of steel in 1925, at St. John, N. B., by the St. John Drydock and Shipbuilding Company, the KIPAWO, is 123 feet overall, 26 feet beam and 9 feet deep amidship, Her power plant is a four-cylinder Fairbanks, Morse two-cycle Diesel of 240 s.hp. turning up 250 revolutions per minute. On a fuel consumption of ten Imperial gallons of Diesel fuel-oil per hour, the KIPAWO will make 11 knots under normal conditions.

On deck, there is a Fairbanks-Morse hoisting gasoline engine, used for lifting automobiles on and off the forward deck of the vessel by means of the derrick and an ingenious sling which raises the cars by the wheels. This sling was invented by Capt. E. T. Terfry, master of the KIPAWO, and has proved most satisfactory.

The KIPAWO usually lays over at Parrsboro—remaining on the mud alongside the wharf until the tide flows in. Her construction is necessarily strong to stand grounding. She is well fitted for the carriage of passengers and has accommodation for nine full-sized automobiles. Chief Engineer W. M. Boston has been in charge of her oil engine since the vessel started, and advised a member of our staff when aboard her recently that he has never had any trouble with them. The passage across Minas Basin from Parrsboro to Kingsport is 14¼ miles, and owing to the strong tides, is often a stormy one. Automobiles are then covered with tarpaulins to protect them from the spray which usually is encountered.



Passenger and automobile ferry Kipawo operating in Bay of Fundy

Unusual Twin Screw Diesel Drive

Twin propellers driven by a single 50 hp. Diesel presented an unusual problem in marine drive in the case of the 64-ft. automobile ferry SPOKANE, operating out of Umatilla, Ore. This boat cuts 80 miles off the distance from Portland to Spokane, Wash., and carries about 125 automobiles a day.

The ferry was designed and built in 1925, at which time two 25 hp. Diesel engines were installed. These engines have now been replaced by a single 50 hp. cylinder Atlas-Imperial Diesel engine which drives the twin propellers through a roller chain gear drive.

The gear box is cast steel and the main shaft is connected to a shaft on either side by means of sprockets and double roller chain which turns both propellers in the same direction. This is the opposite to usual practice, but no difficulty has been found in maneuvering the vessel. With the engine turning 400 r.p.m., the propellers turn 564 r.p.m., and give the ferry a speed of 9 m.p.h. The boat has been in operation for several months and the unusual equipment has worked out very satisfactorily.

Diesel Freighter for Mexican West Coast

Bound for La Paz, Lower California, and flying the colors of the southern republic, the Diesel-powered freighter VIOSCA cleared from San Francisco in July. She will be operated by Rochall, Ruffo & Company of La Paz, trading between points along the Lower California coast and the mainland of Mexico.

The VIOSCA was built by the Anderson & Christofani yard in South San Francisco, and measures 86 ft. long, with a 21-ft. beam and 8-ft. draft. Her engine develops 110 hp., driving the vessel at 7 knots.

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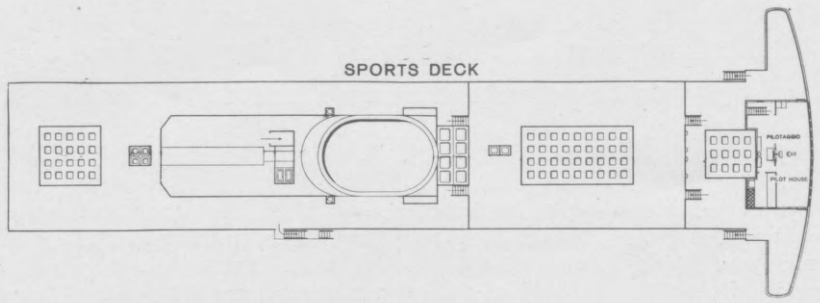
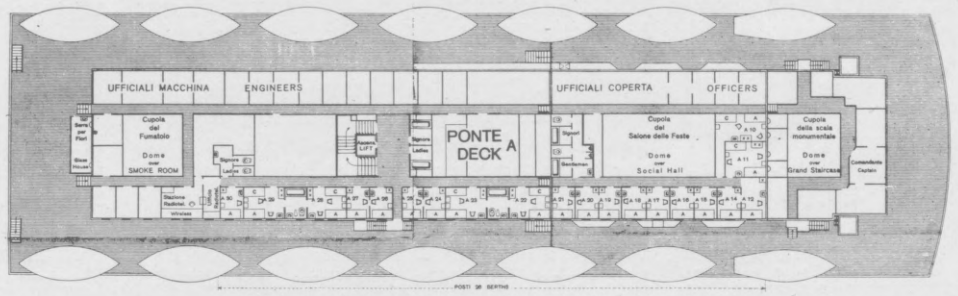
The Twin Screw 20,000 Hp. Motorliner Saturnia's 1st Class Passenger Decks

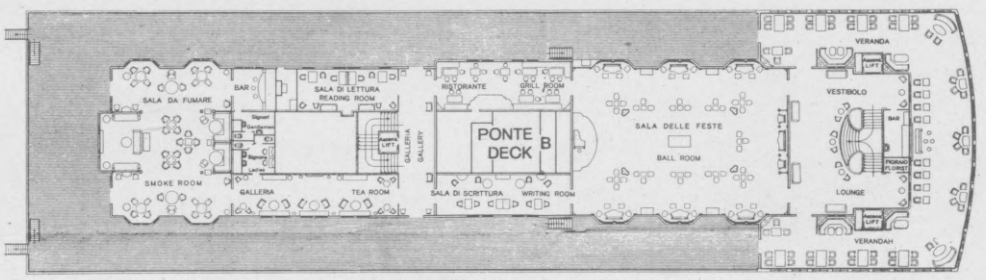
Sports Deck



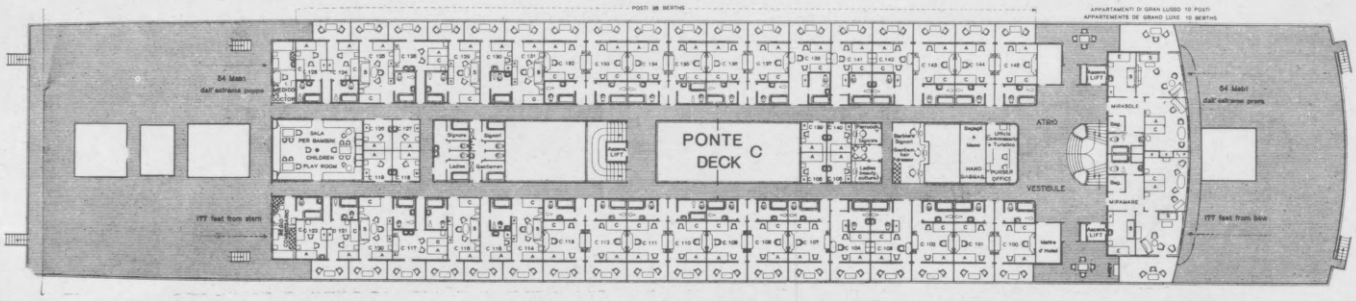
"A" or Boat Deck
Passengers and Officers



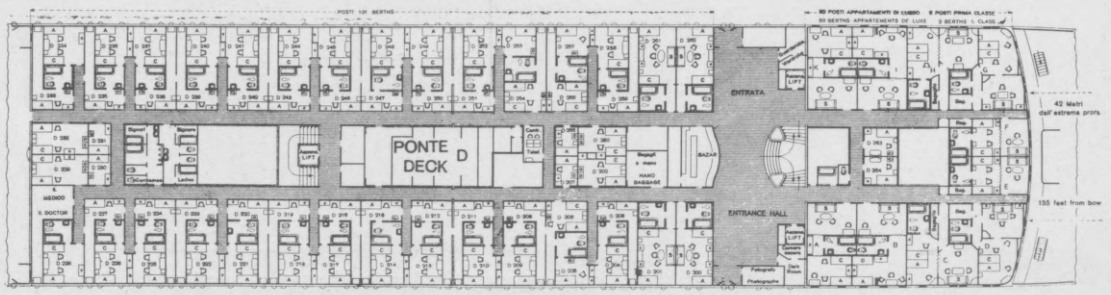
"B" Deck
Large Public Rooms



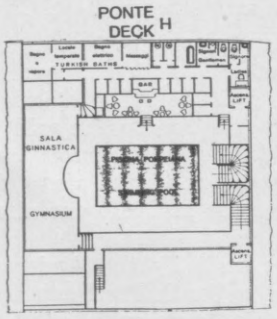
"C" Deck
Suites with Private Verandahs



"D" Deck
Rooms with Bath and Suites de Luxe



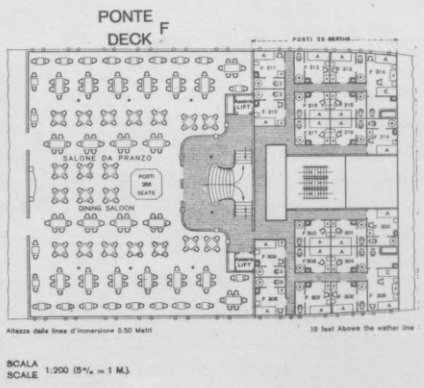
"H" Deck
Swimming Pool



BOW

"F" Deck
Dining Salon and Cabins

STERN



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World's Largest Motor Passenger Liner

Ms. Saturnia Built and Engined by Stablimento Tecnico Triestino, Trieste, Italy, for the Cosulich Lines Trieste-S. America Express Service

ITALY now holds the distinction of having in service, in the Trieste-S. America service of the Cosulich Line, the largest, most up-to-date motor passenger liner in the world and one of the most luxurious passenger liners of any afloat. MS. SATURNIA is a noteworthy addition to post war ship construction and, with her sister ship the VULCANIA, destined on completion early next year for the Trieste-New York run, has set a standard in ship construction which will cause other shipping companies to give very serious thought to their future constructional activities.

Built and engined by the Stablimento Tecnico Triestino, Trieste, she is powered by two double-acting 4-cycle 8 cylinder B. & W. Diesels, built in Trieste, which with supercharging give her a speed just in excess of 20 knots. Her construction throughout, as well as that of her sistership has been overlooked by two well-known British consultants—James M. Dewar (on the engine side) and A. T. Wall (on the hull side).

MS. SATURNIA is constructed to meet the requirements of the Registro Italiano and Lloyd's Register of Shipping, and an important feature of her structural design is the use of high-tension steel for the superstructures. She has two masts and a single elliptical funnel, of similar height to those on the ALCANTARA and ASTURIAS, which gives the vessel a distinctive and not unattractive appearance. The funnel is placed slightly aft of amidships. A powerful radio station is installed on deck A. It consists of a 3-kw. valve set, a 1.5-kw. quenched spark set and an auxiliary transmitter set, a direction finder and three receiving sets, of which the first is of the valve-and-crystal type for the normal service, the second of the short-wave type for special bulletin service, while the third is of the long-wave type. There is also a radio repeater for the different classes.

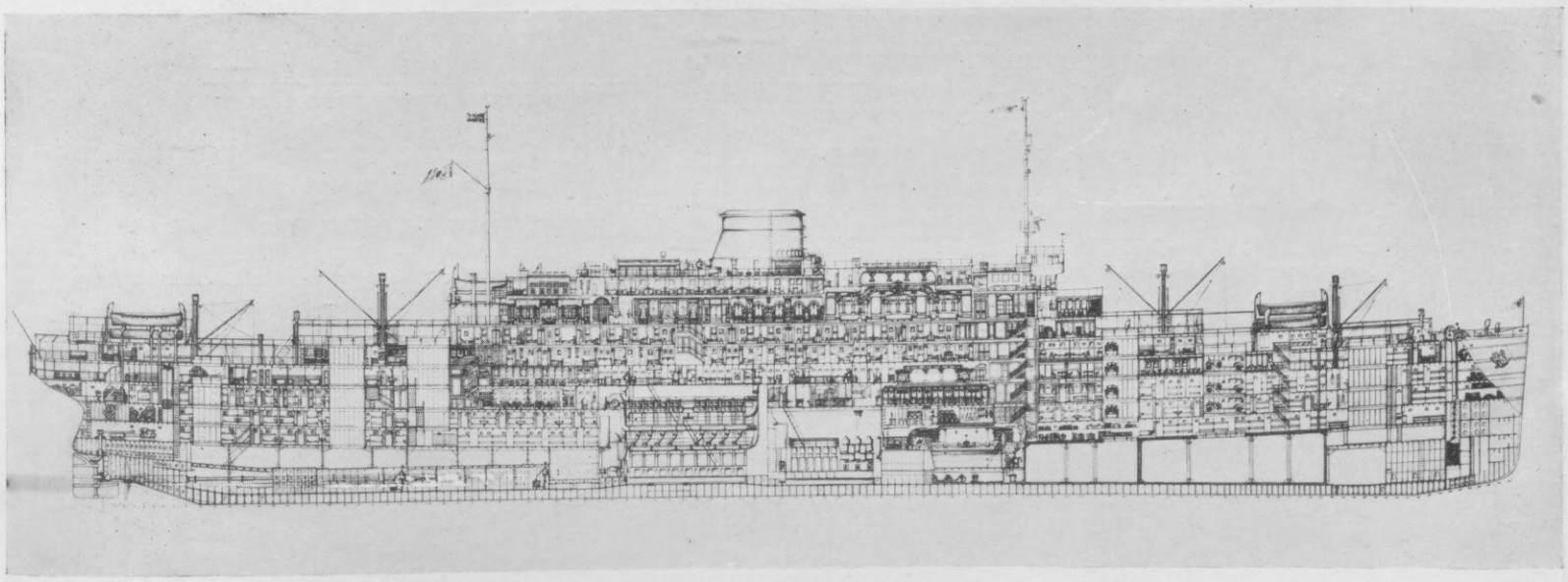
Characteristics of Ms. Saturnia

Length o. a.	631 ft. 3 in.
Length b. p.	599 ft. 0 in.
Beam molded	79 ft. 6 in.
Depth to Main Dk	45 ft. 6 in.
Depth to Flying Bridge	91 ft. 11 in.
Gross Tonnage	23,900 tons
Cargo carrying capacity	4,600 tons
Total power	20,000 b.hp.
Service speed	19 knots

The whole outfit of life-saving appliances comprises 34 ordinary lifeboats and two motor lifeboats, which are also fitted with a special wireless installation. A Sperry gyroscopic installation, consisting of a master compass and repeaters, is fitted on board for navigation purposes.

The propelling machinery of SATURNIA is of the same type as that installed in ASTURIAS and ALCANTARA, but is of higher power. It was built by the Stablimento Tecnico Triestino, under license from Burmeister and Wain, and is of double-acting, 4-stroke type, each motor having eight cylinders, with a cylinder diameter of 33.1 in., the piston stroke being 59.1 in.

Each of the two motors develops 10,000 s.hp. at 125 r.p.m. when supercharged. When the superchargers are not in action, the ouput per engine is 9000 s.hp. at a speed of about 120 r.p.m. Whether the superchargers will be run continuously will depend on the results achieved at sea, but it is understood that the original intentions were that the engines should normally run unsupercharged and the electrically-driven superchargers brought in when additional speed was needed to make



The main outline of Ms. Saturnia differs from that of any existing passenger liner in the pyramidal form adopted

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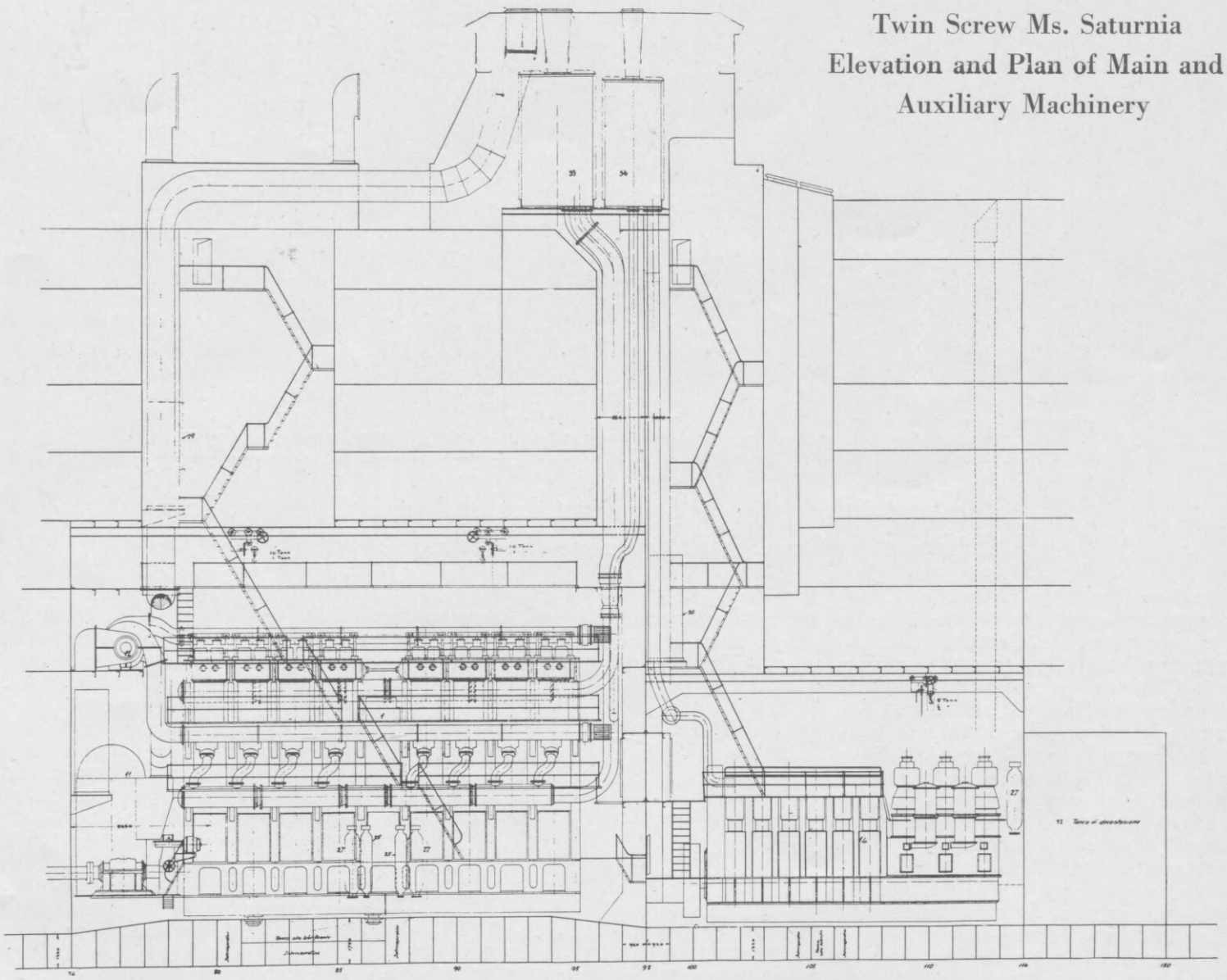
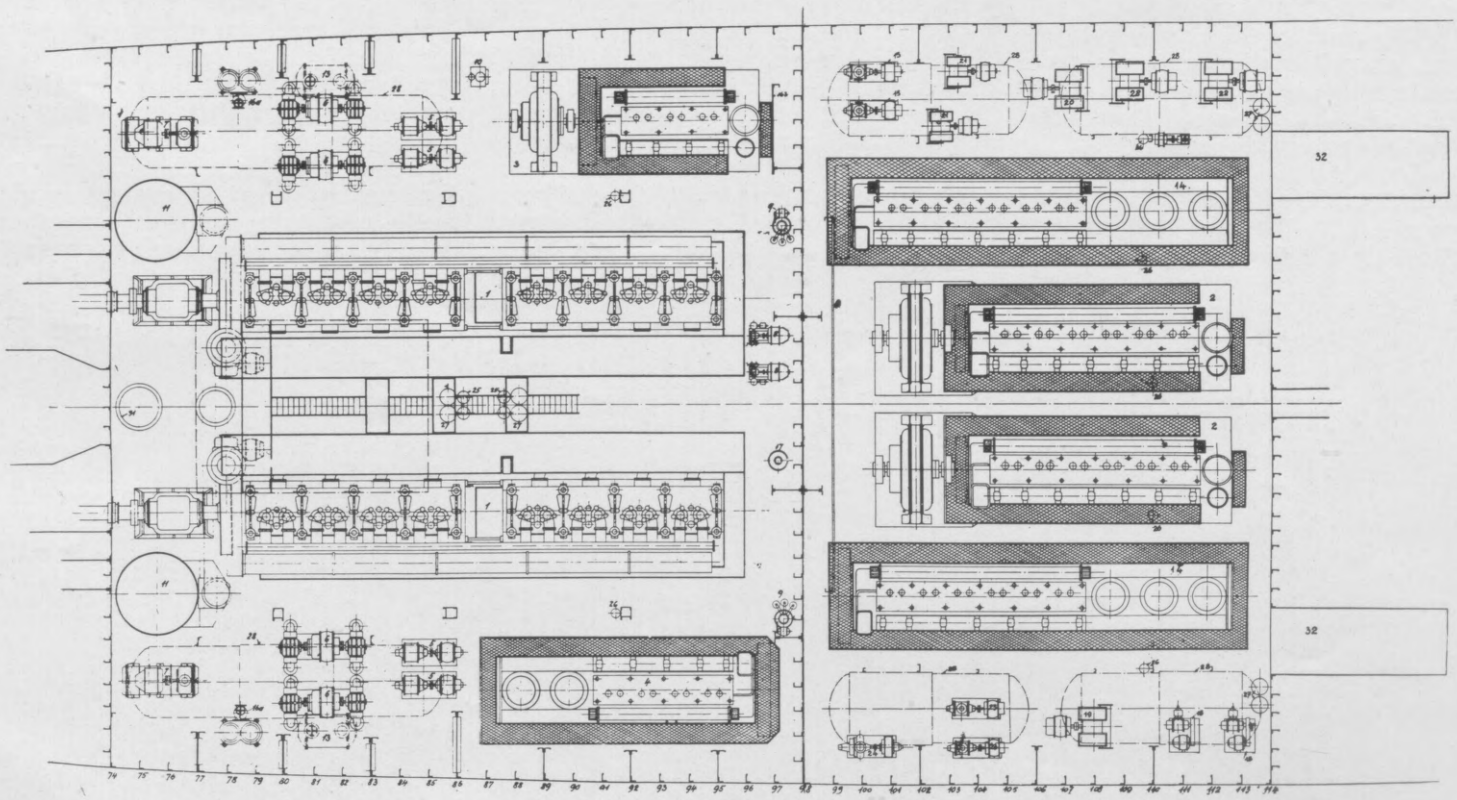
Twin Screw Ms. Saturnia
Elevation and Plan of Main and Auxiliary Machinery





The total length of main and auxiliary engine rooms of the 20,000 hp. motorliner Saturnia is 120 ft., the main engine room being 72 ft. in length

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up time lost on the voyage from heavy weather, fog or other circumstances.

For electric power there are three Diesel generator sets. Two of these are driven by six-cylinder engines, with cylinders 22 in. bore and 36 in. stroke, developing 1800 i.hp. at 195 r.p.m. or 1350 b.hp., whilst the dynamos are of 900 kw. output. In addition, there is a further generating set, with a 3-cylinder Diesel of the same cylinder bore and stroke as the six-cylinder units, running at 195 r.p.m. and developing 900 i.hp., or 675 b.hp. It is coupled to a dynamo of 450 kw. output.

In the propelling engine-room are installed four cooling-water pumps, four lubricating-oil pumps, two fresh-water pumps, two pumps for cooling the cooling water, two for circulating around the lubricating-oil cooler, one Diesel-driven dynamo (450 kw.), one Diesel-driven compressor, two fuel pumps, two electrically-driven super-charging blowers, an emergency steam-driven compressor and two large oil-fired vertical boilers, each 8 ft. 6 in. in diameter with a height of over 19 ft. and a heating surface of 1000 sq. ft. Steam is required for heating purposes as well as for use in the galleys and laundry.

In the auxiliary engine-room forward of the propelling machinery space are two 900 kw. Diesel-driven generators, two 1800 i.hp. Diesel-driven compressors, two water-circulating pumps, a reserve lubricating-oil pump, a ballast pump, two centrifugal fire pumps, a sea-water pump and five other auxiliary pumps, in addition to injection-air reservoirs.

The Diesel-driven compressors fitted on MS. SATURNIA for the supply of compressed air for the injection of fuel to the main engine, as well as for manoeuvring, are the largest that have yet been built. Two are coupled to six-cylinder B. & W. Diesel engines with cylinders of 22 in. bore and 36 in. stroke, running at 175-180 r.p.m., and developing 1800 i.hp. The compressors for these are three separate vertical 3-stage units. There is also a third plant, comprising a four-cylinder Diesel engine of 1200 i.hp., driving twin 3-stage compressors, all the compressors being similar in size and construction; they were built by the A. E. G., Berlin.

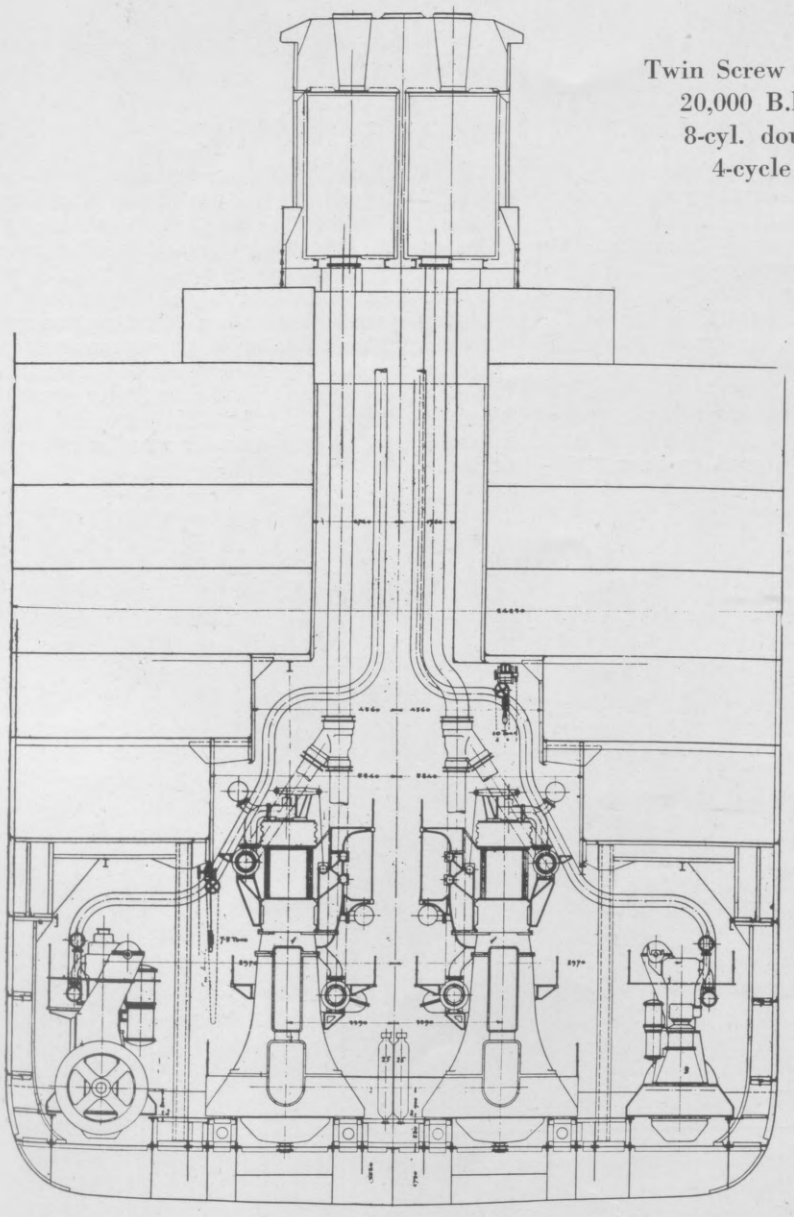
The total length of the main and auxiliary engine-rooms amounts to about 120 ft., the former being about 72 ft. long.

MS. SATURNIA has a speed of 19 knots, and accommodation for 280 first-class passengers, 257 second-class, 309 intermediate first and second-class, and 1350 third-class passengers. The officers and crew number 441, giving a total complement of 2638. There are eight decks, and six cargo holds forward and aft of the machinery spaces below the passenger accommodation; 4600 tons of cargo can be carried. Number 2 hold has 72,300 cu. ft. refrigerated space for meat, and in Number 3 hold there is a further space of 52,600 cu. ft. for chilled meat. MS. SATURNIA is built with a Duct-keel, and double-bottom tanks are provided throughout for the carriage of water, fuel and lubricating oil. The amount of fresh water which can be carried is about 2500 tons. There are eight decks, and ten transverse watertight bulkheads.

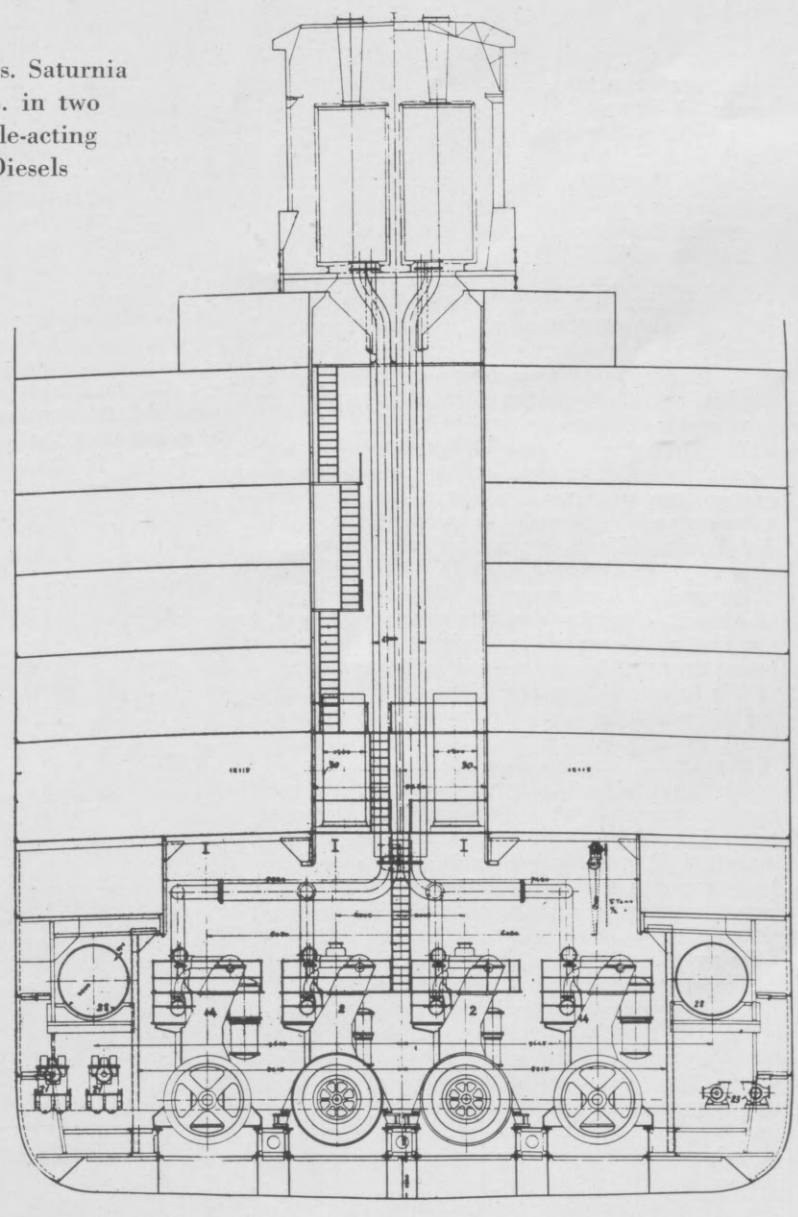
On deck "A," there are on the starboard side first-class single-berth cabins, all outside cabins, and on the port side, cabins for the deck and engine-room officers.

On "B" deck, reached by stairway or elevator, are the main first-class saloons. These are the lounge, social hall, writing-room, and tea-room, grill-room, library and smoke-room. The lounge, which is 33 ft. by 43 ft., has access to the grand stairway. The social hall, 63 ft. long and 46 ft. wide, is the largest and highest saloon in the vessel, having a dome 17 ft. high. Six large bay windows open out on to the promenade, 16 ft. wide, which is sheltered forward by large glass sliding windows. The social hall will be used for dancing, and has, therefore, a parquet floor, a dais being provided for the orchestra. On the port side is the grill-room, and on the starboard side the writing-room, 13 ft. by 39 ft., panelled in blue lacquer. The other passenger decks and their arrangement are shown in the drawings. The Pompeiian swimming pool occupies the central part of Deck H. This pool is one of the SATURNIA'S most attractive features. It is 30 feet long and 24 feet wide.

Twin Screw Ms. Saturnia
20,000 B.hp. in two
8-cyl. double-acting
4-cycle Diesels



Section through Ms. Saturnia's main machinery room



Section through Ms. Saturnia's auxiliary machinery room

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Small Mechanical Injection Diesels–4

This Article Deals Particularly with the Types of Mechanical Injection Diesels Specially Developed on the Pacific Coast

AS stated in the first article, many Pacific Coast manufacturers anticipated the need for small Diesel engines and an intensive period of development followed.

The Atlas-Imperial Engine Company of Oakland, California, was the first to get a line of mechanical injection Diesel engines on the market.

The Enterprise Engine Company of San Francisco secured the rights to build marine engines from the Western Machinery Company of Los Angeles, California, who for some years previous had built a stationary Diesel engine operating on a modified cup system. Later the Enterprise Engine Company was absorbed by the Western Machinery Company and the Western-Enterprise high pressure mechanical injection Diesel engine was offered the trade as the developed product of both concerns.

In the north Pacific Coast, the Washington Iron Works of Seattle, Washington, began building the Estep Diesel Engine.

The Union Gas Engine Company of Oakland, California, builders of the first marine gasoline engine in the world, were later in introducing their Diesel engines due to the pressure of navy aeroplane engine work and the long and careful experimental and development period taken to perfect their product.

The Pacific Diesel Engine Co of Oakland, California, also designed and built a mechanical injection Diesel engine to take care of their trade.

The Hicks Engine Company of San Francisco, developed the Star Diesel Engine for small fishing craft.

The Atlas-Imperial marine Diesel is provided with push rods for actuating the valve rockers. Four push rods are used for opening and closing the valves for each cylinder. These valves include the fuel, air starting, exhaust and intake vales.

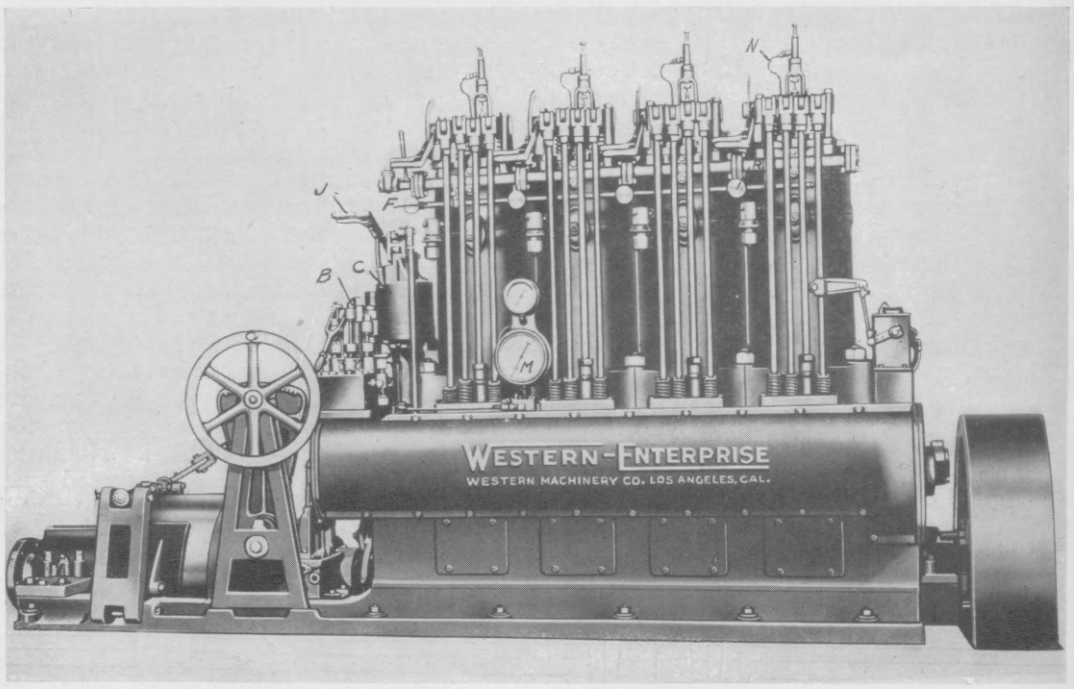
The fuel system of the Atlas-Imperial engine consists, briefly, of a high pressure plunger type of fuel pump, a common rail or manifold to which branches are attached from each fuel valve in the engine cylinder heads, a spring loaded compensator of the plunger type and a resilience chamber.

The fuel pump B is of the constant stroke, constant discharge type and the displacement of the two plunger discharges fuel into the common rail F, placed alongside of the cylinder heads. The isolating valves R are arranged to cut off the fuel to any fuel valve at the will of the operator. The common rail is of such capacity that the pressure drop to the fuel valve controlling injection, is a minimum drop. The outer end of the common rail is in communication with resilience chamber T, which absorbs the plunger pulsations by virtue of its large volume of fuel content. A connection from resilience chamber T is attached to the fuel pressure gage M indicating the pressure at the tail end of the system. In order to govern the pressure within manifold F, a compensator U is arranged to bypass excess fuel by altering the spring tension on a compensating plunger. This is accomplished at the will of the operator by altering the position of the hand lever on top of the compensator.

The quantity of fuel admitted into the cylinder is partly determined by the pressure with manifold F and principally by the lift of the fuel valve needle. In this way the fuel valve needle regulates the quantity passing into the combustion chamber, but the rate of introduction of this quantity of fuel, may be altered by the pressure within the fuel valve body.

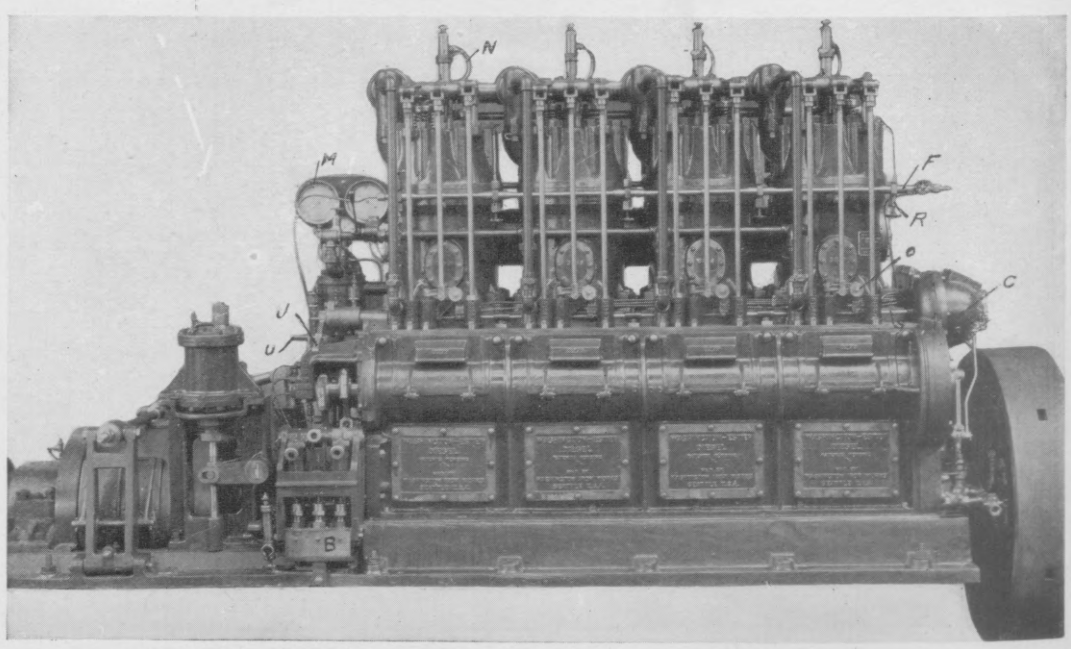
Governor control is obtained by varying the length of the push rod attached to the fuel valve rocker X. In other words, a lost motion exists between the lower end of the fuel valve push rod and the top of the roller carrier. A long wedge is moved in and out between these two extremities and in this way the lost motion is taken up or increased. The governor C alters the angular position of the layshaft S in such a way that the push rod clearance or actual height of lift of the needle valve is controlled by the governor. Lever J controls the spring tension exerted against the fly-balls of the governor C so that the variable speed control feature is obtained by altering the position of the lever J.

The fuel is strained through strainer K before entering the two fuel pump plungers of pump B. An additional strainer is placed close to the fuel valve bodies so that all dirt particles equal to the size of the nozzle or larger, are effectively choked off and prevented from entering the fuel valve nozzle.



The Western Enterprise Diesel—of push rod operated type

The Western-Enterprise marine Diesel is also of the push rod construction. The fuel system is somewhat similar to that of the Atlas engine. A two-plunger constant-stroke fuel pump B is driven from the extremity of the camshaft. The fuel is discharged into a chamber to which two sets of relief valves are attached. This chamber is in communication with the manifold F, from which branches run to the fuel valves in the cylinder heads. Manifold F is also provided with isolating valves R so that any cylinder may be cut out at will.



The Washington—Estep Diesel, a well-known West Coast engine

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The governor C controls the lift of the fuel valve needles by altering the lost motion of the fuel valve push rod. The tension of the springs in governor C is altered by lever J directly above the governor.

The fuel system is also provided with a resilience chamber (not shown in the figure) and a fuel pressure gage M at the outer extremity of the fuel system. The two relief valves serve the purpose of relieving the fuel system of excess fuel. By this means the pressure is controlled in manifold F. One relief valve is set at high pressure, while the other is set at moderate pressure. When running at full load, the high pressure relief valve is available for relieving fuel at a predetermined pressure. The second relief valve set at a lower pressure, is only brought into communication with the fuel system when idling conditions or slow speed running are desired by the operator.

The fuel valve is different in construction from that of the Atlas in that the full fuel pressure is carried to a chamber above the fuel valve needle through pipe N. Therefore, only a small spring is necessary to return the fuel spraying period. The pressure of the needle to its seat upon completion of the fuel above the needle, acts on a differential area and therefore serves the purpose of maintaining a tight seat in the fuel valve nozzle.

The Pacific marine Diesel is arranged quite differently from that of the Atlas and Western-Enterprise engines. A camshaft placed alongside of the cylinder heads, actuates the fuel valves directly through short rocker arms. The fuel valves are placed in a horizontal position as indicated at Y.

A two plunger horizontal fuel pump, driven from a vertical shaft is located at B. The discharge chamber of the fuel pump is in communication with the spring loaded compensator U. The fuel pump is of the variable bypass type but is not controlled in bypass action by the governor.

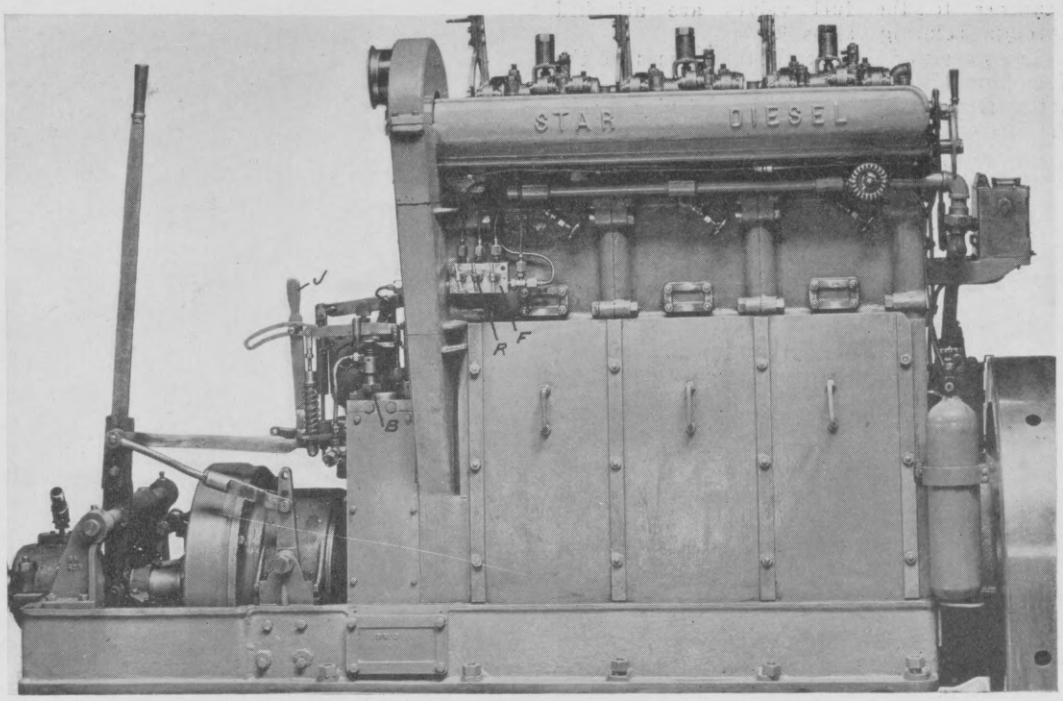
Governor C controls the movement of layshaft S, which in turn alters the lost motion on the fuel valve needles through the angular position of lever Z. Lever Z actuates a scroll nut above the tappet end of the fuel valve rocker. The tension of the springs in governor C is varied by lever J, thus effecting speed control.

Fuel from the fuel pump enters manifold F. to which isolating valves R are attached controlling the passage of fuel to the fuel valve bodies. Gauge M is in communication with a resilience chamber which is attached to the outside communication of the manifold F.

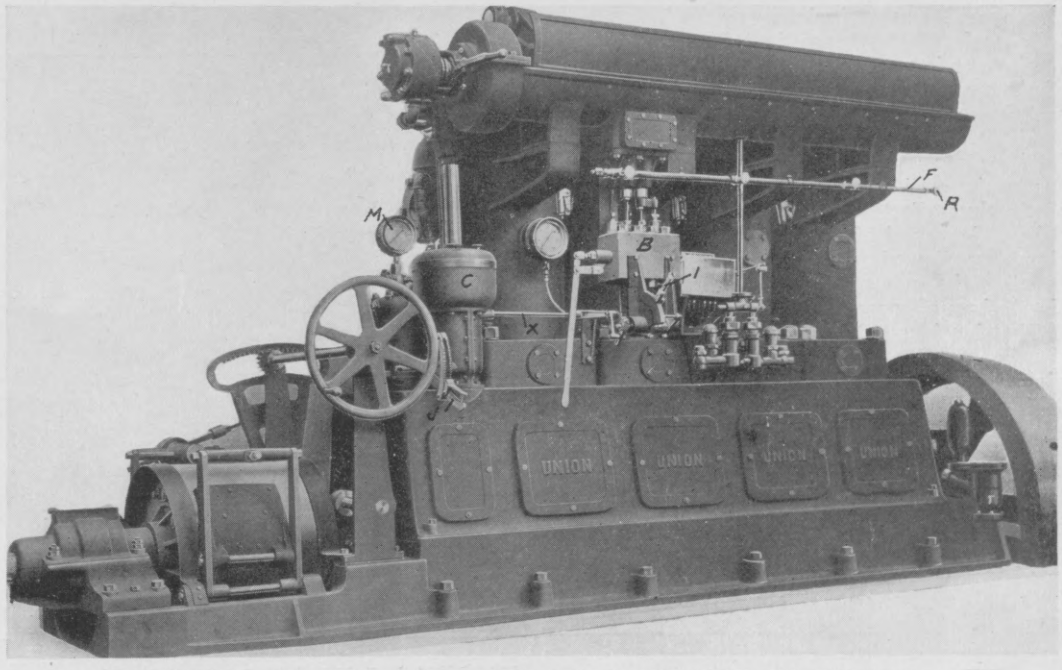
The Washington-Estep marine Diesel is provided with a fuel system in which a two plunger, constant stroke fuel pump B, driven from the end of the camshaft, discharges fuel into a spring loaded compensator controlled in spring tension by lever U and communicating with manifold F, to which fuel lines are attached to the fuel valve bodies. The outer end of the manifold is connected to a resilience volume contained in a chamber located on the backside of the crankcase housing. Governor C controls the lift of the fuel valve by increasing or decreasing the lost motion in the push rod system. Governor C actuates layshaft S in a horizontal direction which in turn controls the position of eccentric O, thus determining the lost motion. The fuel valve is pressure-balanced through pipe N and the fuel pressure is indicated on gage M and is controlled by lever U.

The Union marine Diesel is constructed with a horizontal camshaft close to the cylinder heads, thus shortening the valve operating mechanism.

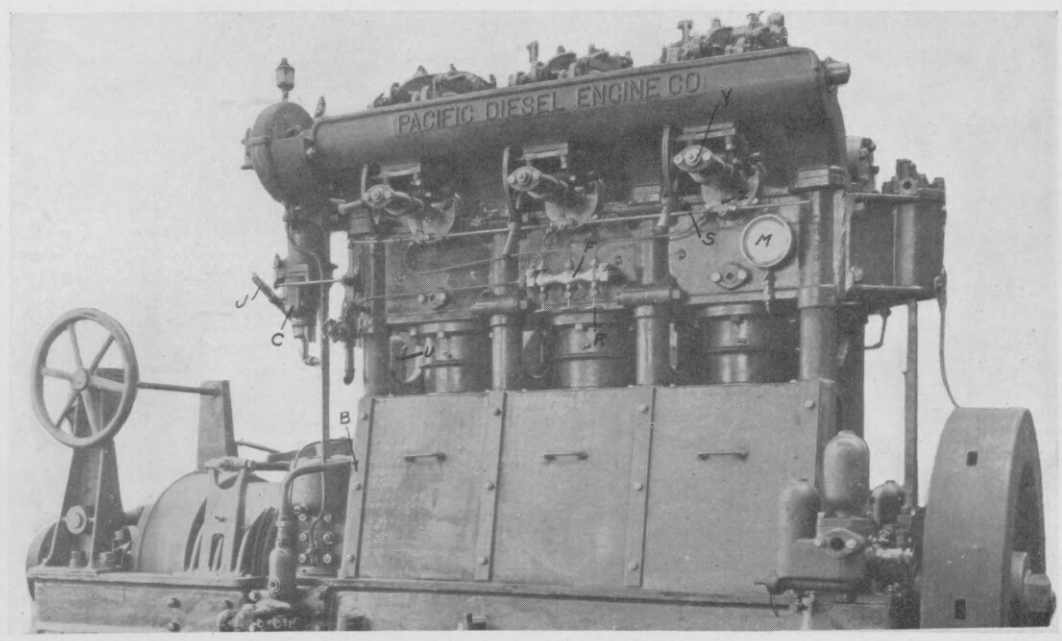
The two plunger fuel pump B is of the variable bypass type controlled in output by the governor shaft X or hand lever I, which determines the point of seating of the suction valves in the fuel pump. Fuel from the pump B is discharged into manifold F, from which



The Star type marine Diesel has a compact external appearance



The Union Diesel has been used in some San Francisco Bay tankers



The Pacific Diesel has a number of noteworthy Diesel-electric applications

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branches to the fuel valves are attached through isolating valves R.

The governor C controls the bypass of the fuel pump B simultaneously with the lift of the fuel valve needles in the cylinder heads. A horizontal layshaft placed on top of the cylinder heads controls the horizontal position of wedges which vary the lost motion between the tappet end of the valve rockers and the adjusting nuts on the fuel needles. Governor C automatically controls the speed at any point, depending upon the position of lever J, by varying both fuel pump pressure and fuel valve lift. Lever I is an auxiliary manual adjustment controlling the fuel pump pressure. A resilience chamber over which gage M is placed, assists in dampening pulsations in manifold F.

The Star marine Diesel has a fuel system similar to that of the Pacific Diesel engine. Fuel from fuel pump B passes into a compensator chamber controlled by lever J, into manifold box F, through isolating valves R, to each fuel valve on the cylinder heads.

In order to start a small engine of this type on low pressure air, each cylinder is provided with a mechanism controlled by lever Y, which converts each cylinder into a two-cycle starting engine until sufficient speed is attained, when lever Y is thrown to the four-cycle operating position and fuel is sprayed into the cylinder causing the engine to operate on the four-cycle Diesel principle.

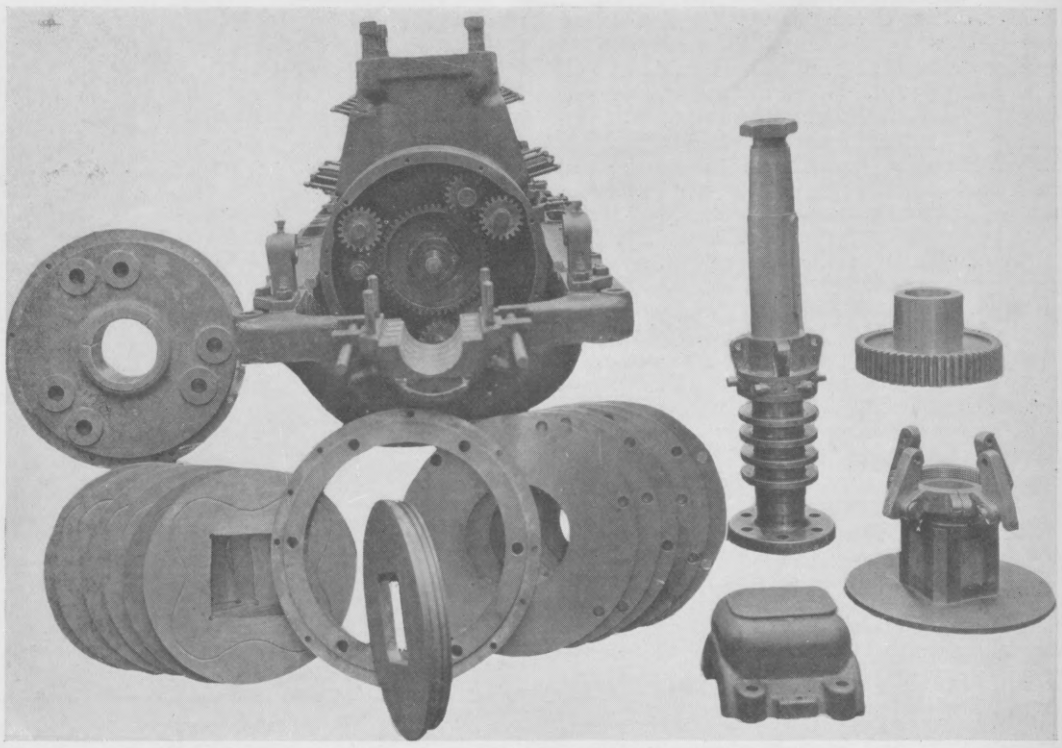
In each of the types just discussed, a reverse gear is necassary to accomplish reversal of the propeller in an engine of less than six-cylinders.

Above is one type of gear pot used on the Pacific Coast engines. A plate clutch engages the main engine crankshaft with the thrust shaft, thus effecting ahead rotation of the propeller. Reversal of the propeller is effected by clamping the planetary gear drum, thereby causing the energy to pass from the crankshaft through gearing to the thrust shaft.

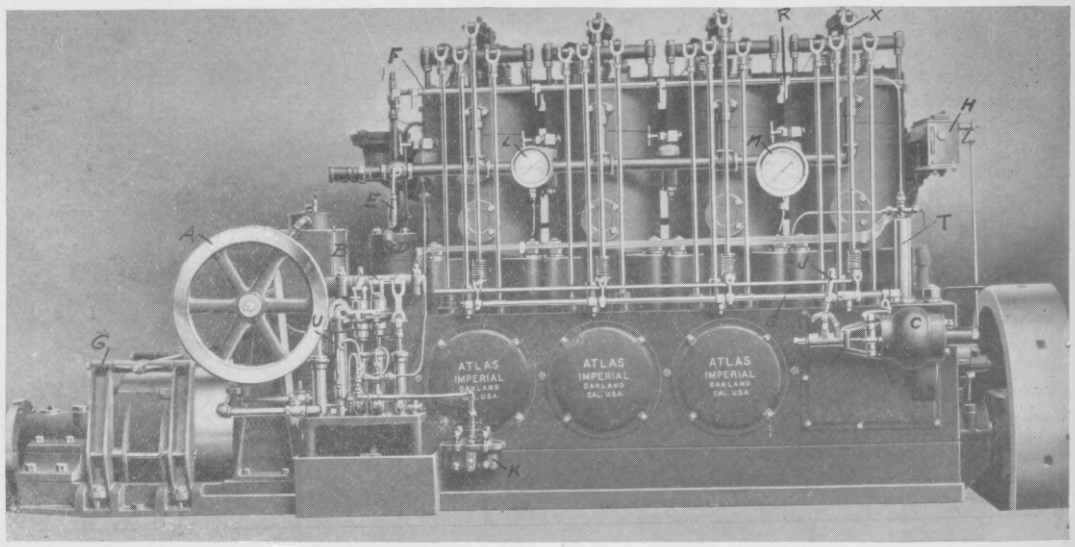
The development which has taken place on the Pacific Coast in small marine Diesel engines of the mechanical injection type has stimulated engine manufacturing throughout the United States. Further developments are being made in smaller sizes for heavy duty constant load service.

During the year 1926, over 55,000 hp. of engines in sizes of 400 b.hp. and under, was sold on the Pacific Coast. This business totaled in value over $4,000,000.

(*Concluded*)



Gear pot used on a Pacific Coast Diesel



The well-known Atlas Imperial Diesel engine

Diesel Engine Design

An opinion is frequently expressed among Diesel engineers to the effect that this class of machinery is not as amenable to scientific methods of treatment as the attention given to it by educated technicians would seem to warrant. According to these views, there is a hiatus between the actual behavior of Diesel engine elements and the account which theory gives of it. Without going too deeply into the merits of this question, little doubt seems to have been left that many theories advanced as explanations for various Diesel phenomena have at least been inadequate.

Recently, however, the Diesel engine industry seems to have evolved a type of man who embodies a happy combination of fact-finding with respect for theory in those instances where it serves its legitimate function of illuminating facts. A book which seems to have come nearer than any other to expressing this mental attitude is "Diesel Engine Design," by H. F. P. Purday. Containing 332 8½ in. x 5¼ in. text pages, it is published in Great Britain by Constable & Company, and is obtainable from MOTORSHIP.

As its name implies, it is addressed primarily to the drawing-board engineer and technical student, who is presumed to have the equivalent of a technical high school education, but not a Doctor of Engineering degree. However, this fact is expressed rather by the author's orderly method of treatment than by widespread application of numerals and formulae. It is apparent from the entire work that the author knows the limitations of the scientific method in its application to Diesel engine work only too well. As a matter of fact the book is concerned preponderantly with a discussion of empirical data relating to Diesel engine construction. Such theory and mathematics as do occur appear to have resulted almost entirely from the unavoidable process of striving to utilize information from existing engines for the advantageous construction of other machines. A modest use of science such as this should have a much more profound appeal than the more spectacular attempts of scientific pundits who make a pretense at being able to deduce the majority of engine details from abstract first principles.

It is in the frame of mind of the patient dealer-in-facts, assisted here and there by a mathematical or scientific turn, that the author of "Diesel Engine Design" carefully plods through the long list of crankshafts, cylinders, pistons, valves and the like. Unlike most writers on subjects of this kind, he makes his categories of engine parts unusually complete. This fact, and the felicitous application of theory and science already noted, should make the book find a wide appeal.

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